ENCYCLOPÆDIA BRITANNICA

WITH REVISED AMERICAN SUPPLEMENT

A GUIDE TO SYSTEMATIC READINGS

IN THE

NEW WERNER TWENTIETH CENTURY EDITION

OF THE

ENCYCLOPÆDIA BRITANNICA

BY

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PREFACE

To the Guide to Systematic Readings in the New Werner Twentieth Century Edition of the Encyclopædia Britannica.

Although the *Encyclopædia Britannica* has long been recognized as the greatest of reference works, and although its possessors may have never consulted it without complete satisfaction, yet its full value has seldom been recognized. It has usually been regarded simply as a repository of general information, to be kept ready at hand for consultation as occasion should demand. But while this is the ordinary use of the *Britannica*, it has been found that it possesses a broader function, and that it may be utilized in such manner as to perform the office of a great educational agent. The *Britannica* is a work of reference, and much more: it is a collection of all histories, all biographies, all arts, all literatures, and all scientific, professional, and mechanical knowledge; but on account of its comprehensiveness, extending as it does through so many large volumes, it presents such an "embarrassment of riches" that those who consult it fail sometimes to discover *all* that is suited to their individual needs. It is evident, therefore, that if each reader and patron of this great library can have a guide to point out to him, according to his vocation, the parts that are the most helpful to him, he will be able to systematize his reading or his investigations; and thus, while economizing both time and labor, reach the highest results. The present volume has been prepared for that purpose; and it is believed that, recognizing its helpfulness, the many thousand owners of the *Britannica* will welcome it as an invaluable addition to their libraries. The plan has been to direct each individual how to draw from this great storehouse of knowledge that which will cover with all desirable completeness the line of work in which he is most interested, thus assisting him in the knowledge of his particular business, and aiding him in its prosecution.

It being recognized that the *Britannica* contains a great deal of interesting and profitable matter for boys and girls, the first part of this Guide is addressed to young people. By the aid of brief but graphic text and copious references, the youth is led along pleasant avenues of research, and thus aided in acquiring a habit of reading and of investigation that will continue through life, and add largely to his chances of success.

The second part is designed specially for students. The scholar who is desirous of some means whereby to supplement the work of the school or the college will find here the very thing he is seeking. The earnest, ambitious young man or young woman who is being self-educated, because unable to secure the aid of instructors, will find here a teacher that will point the way to the acquisition of a thorough knowledge of almost every branch of science or art. Numerous courses of study are outlined, which may be pursued independent

of schools; many profitable lines of research are suggested, and the best ways of obtaining a fund of general information are pointed out.

The fact that the Britannica contains treatises from which have been drawn fifty-two text-books used in leading colleges and universities emphasizes its value to students.

Through our excellent system of common schools, every boy or girl in the land is furnished with the rudiments of an education. But in the school the child is only started on the way; the best that can be done is to provide him with a few essentials, and give to him some slight impetus that will keep him moving on in the right direction. If he continue his studies beyond the public schools, he may be conducted a little farther—but it is only a little. No one's education was ever finished in a university. We are all, to a greater or less degree, self-educated. A great deal of what the schools foist on us as knowledge proves to be worthless to us, and is allowed to drop from our minds as soon as we are left to ourselves. The better part of our education is that which we acquire independently—through reading, through observation, through intercourse with others—an ever-increasing stock of what is called general information. It is the aim of this GUIDE to help, not only students, but everybody else, to gather this information in an orderly way, without unnecessary expenditure of time and labor.

The third part of this volume is devoted to the busy world at large. Its object is to help the busy man, no matter what his business may be, to pick out from the *Encyclopædia Britannica* just that kind of information which will be of the greatest value to him in his calling. There is hardly a trade, industry, or profession in the civilized world that is not noticed somewhere in this department. A mere glance at the various chapters will indicate their practical value.

On the whole, it is confidently believed that the plan of using the *Encyclopædia Britannica* presented in this GUIDE will fill a gap and perform an important service in our system of education. It should be a very material aid, not only to those whose schooldays have been brief, and who wish to continue their studies without the guidance of a teacher, but to people of every class and condition in life—to students, merchants, farmers, mechanics, housekeepers, and professional men of all sorts. It should enable boys, girls, men, women, and whole families to spend their leisure hours pleasantly and profitably with this great New Werner Twentieth Century Edition of the *Encyclopædia Britannica*, thus realizing one of its most important aims by making it the most powerful aid to home culture or self-education that the world has ever known.

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AKRON, OHIO.

PREFACE

TO

THE NEW AND REVISED EDITION

THE publication of five new volumes of supplementary matter to the New Werner Twentieth Century Edition of the *Encyclopædia Britannica* not only furnishes an opportunity for the revision and enlargement of this GUIDE, but renders such a revision an absolute necessity. Encouraged by the flattering reception accorded to the first addition of these systematic readings, the compiler has ventured to extend the original plan by the addition of twelve new chapters, besides the insertion of many hundreds of references not previously included in the work. Some of the former readings have been entirely rewritten, and the chapters in the third division have been arranged in more logical order. It is believed that, in this revised edition of the GUIDE, but very few divisions of human thought or human activity have not received some attention. An examination of the index at the end of the volume will reveal the comprehensive nature of its contents. The five new volumes (numbered XXV to XXIX) added to the New Edition of the *Encyclopædia Britannica* are designed to bring the work up to the present time.

Oct., 1899.
Dec., 1902.
Oct., 1903.
Sept., 1904.
May, 1905.

MEN may gain a comprehensive knowledge of the world in two ways—by Experience, and by Reading. Experience comes with age. Reading is a substitute for it. By reading we gain the experience of others. The *Encyclopædia Britannica* is a record of the experience of men from the beginning of time to our own age, and in every field of activity and thought.

CONTENTS

INTRODUCTION

"IT IS ours—this superb New Werner Twentieth Century Edition of the *Encyclopædia Britannica*—and now how shall we use it in order to derive the greatest possible benefit from it?" This is probably the question which more than one purchaser of the *Britannica* asks himself as he removes the bright new volumes from their wrappings, and contemplates his lately acquired possession. Let us first arrange these thirty volumes side by side on their shelf, and take a look at the work as a whole.

It is the greatest work of its kind in the world, everybody says. In these volumes are the elements of a complete education in any branch of knowledge that you may choose. You can scarcely mention a subject about which men think and talk, that does not receive its share of attention somewhere in this wonderful work. It contains a rich fund of information for everybody, from the schoolboy or schoolgirl to the most learned philosopher. It is valuable alike to the farmer and to the merchant, to the mechanic and to the professional man. Turn over the pages of a single volume, and notice the great variety of articles, some necessarily brief, others very long and comprehensive. Notice the numerous illustrations, the maps, and the fine full-page plates. See the list of famous specialists and well-known writers who have helped to make this volume. Surely this is a work which every man ought to be proud to own.

What shall we do with it?

But unless we know how to use our *Encyclopædia*, we shall fail to get from it as much benefit as we might. No book is of value unless its owner knows how to extract some pleasure or profit from its pages. It will not be hard to get both pleasure and profit from the *Britannica*, even though we should allow it to remain on its shelf and consult it only when we want to find the answer to some question that is asked. Most people use an encyclopædia in that way; and many do not know that it was designed for any other purpose. That is the proper and only way in which

to use a dictionary. But the *Encyclopædia Britannica* is a great deal more than a dictionary, and it is capable of imparting more knowledge and more enjoyment than all the dictionaries in the world.

In order that we may make the most of the rich storehouse of knowledge that is ours, let us consult our GUIDE TO THE ENCYCLOPÆDIA BRITANNICA. Here a large number of the most interesting subjects are arranged systematically under appropriate headings or in special chapters. The first five chapters refer to subjects that are of interest to young people. There are thousands of older people, too, who will like these chapters.

Young People's Department

The next seventeen chapters are designed to aid students and specialists in the prosecution of their studies and investigations. The vast range of the *Britannica* is nowhere better illustrated than in these chapters. Among the easier courses in reading here marked out are those in History (Chapter VI), in Geography (Chapter XIII), in Bible History (Chapter XIX), and in Mythology (Chapter XX). In Chapter XI there are three courses in Zoölogy—the first two being popular courses, which everybody may understand and enjoy; the third, a purely scientific course, intended for only special students. Some other chapters, notably that on Mathematics (Chapter XV), refer to subjects and articles in which only scholars and specialists usually take an interest. Although they may seem of but little use to us now, there will probably be a time when some of us will grow up to them, and find them to be exactly what is required to meet our wants. Besides this, some of our neighbors and friends are now specially interested in those subjects, and would not want such articles omitted.

Students' Department

After the Students' department, there are more than forty chapters showing tradesmen, farmers, teachers, and others how to derive the greatest good from the *Britannica*. Some of these chapters are sufficiently broad in their scope and character to be of interest to every intelligent person, no matter what his calling in life. For instance, what man in this country will not be benefited by a study of the chapter entitled "The American Citizen"? What American citizen will not find much interesting and valuable information concerning the history of money, the conflict of standards, and the national finances, in the brief chapter entitled "The Banker"? To young men and young women wishing to enter the civil service of their city, state, or country, in any capacity, the chapter for "The Candidate for the Civil Service" will give much information and assistance that cannot be easily obtained from any other source. Here is a chapter to aid the young lawyer in fitting himself to take a higher position in his profes-

Busy People's Department

sion. Here is a chapter for the preacher, showing him what a complete theological library every owner of the *Britannica* has at his service. Here is a chapter for the farmer, telling him where he may learn all about soils and crops and fetilizers and farming tools, and the thousand other things which interest all intelligent tillers of the ground. Here is a chapter for the soldier, and for all would-be soldiers, directing them to a vast fund of information about wars and battles and fire-arms and military law—such as can be found in no other single publication in the world. But it is needless to enumerate further. A glance at the pages which compose the latter half of the book will show that no person in all this busy world of ours has been forgotten. Surely, with so many hints and helps at our hands, we shall not be content to use our *Encyclopædia* merely as a dictionary. The GUIDE will suggest many ways in which we may begin immediately to make it yield us large returns of pleasure and profit.

Family Reading Circle

Would we engage in some kind of intellectual employment during the long evenings of winter? Let us form ourselves into a family reading circle, and read some of the lighter courses suggested by the GUIDE (see Chapters I, II, III, IV, VI, XII, XVII). Would we like to know where we can pick up something to read occasionally for pastime rather than for study? Let us see if Chapter XXII will not help us. Do we want to improve our brawn and muscle through systematic and pleasurable exercise? We may find something in Chapter V, on games, sports, and pastimes, that will point out the way. Is Tommie troubled about the composition that he is to write for the examination at the school? Perhaps the chapter (LIX) for the Writer will be found helpful. Is Mary anxious to become a teacher, and yet not ready to begin a course of study at the normal school? In Chapter LVIII the GUIDE will direct her to some very complete courses of reading on subjects concerning which no teacher can afford to be ignorant. Is John, who cast his first ballot last year, deeply interested in politics, and hopeful that he may some time become a candidate for public office? Let him devote his spare time to the study of such articles as the GUIDE indicates for the American Citizen, the Public Speaker, and the Political Economist. Is Andrew skilful with tools, and handy about making things? The GUIDE has numerous interesting suggestions for the Inventor, the Mechanic, the Electrician, and the Engineer.

And so, for every person and for every occupation in life, the *Encyclopædia Britannica* comes with its inexhaustible fund of information; and this trusty GUIDE which accompanies it shows each person just how he can best extract the information which he needs.

EXPLANATIONS.

References to the Britannica

The references in the GUIDE are necessarily brief, but there will be no trouble in understanding them. The titles of important subjects are frequently printed in SMALL CAPITALS; but where a number of titles occur in a single list, all are generally printed in plain lower-case letters. The volume of the *Britannica* is indicated by Roman numerals; the page by Arabic figures. Occasionally the letter *a* is used to indicate the left-hand column of a page, and the letter *b* the right-hand column, accents being added to show whether the matter referred to begins at the top, the middle, or the bottom of the column. When the page referred to is found in the New American Supplement (comprising five volumes), the figures denoting it are preceded by the volume numbers XXV to XXIX.

EXAMPLES.—Notice the following references:

(1) Bracelets, IV, 169.
(2) Quill pens, IX, 53a."
(3) Sea serpent, XXI, 638b."'
(4) Bells, XXV, 419 and 420.
(5) May-day customs, XV, 654b."

It is easy to understand what each one of these references means. An examination of them, in connection with the explanations above, shows us

(1) That the article on BRACELETS is found in volume IV, page 169.

(2) That QUILL PENS are described in volume IX, page 53, beginning at the middle of the first column.

(3) That an account of the SEA SERPENT occurs in volume XXI, 638, beginning at the bottom of the second column.

(4) That there is an article on BELLS in volume XXV, pages 419 and 420.

(5) That an account of MAY-DAY CUSTOMS may be found in volume XV, page 654, beginning near the middle of the second colume.

So many special subjects receive treatment in some of the chapters, that no mere chapter-headings are sufficient to indicate everything that is included within their limits. For example, there is no distinct chapter for the shoemaker, the carpenter, the mason, the cook, the fisherman; but each of these busy workers receives his share of attention in the GUIDE. Look for these names, not in the table of contents, but in the Index at the end of the volume. It will be convenient to use this Index often.

Few persons will have any difficulty in using the INDEX VOLUME of the *Britannica*. In most cases, if you desire to make a complete study of any

given subject, it will be best to look for that subject at once in the Index volume. The word which you are looking for will probably be found in its proper alphabetical place. There you will be directed to every article or passage in the *Britannica* wherein any important mention of the subject occurs. The first reference is usually to the special article on the subject; or, if there is no special article, it will direct you to the next best thing—the fullest or most complete description. For example, suppose you want to learn all about the Indians. Turn to the Index volume, and on page 456 you will find the following entry:

The Index Volume

> Indians, American, XII, *a* 862–74; American, I, *b* 602; literature of (Eliot), VIII, *a b* 128; renewal of (United States), XXIII, *a* 800; treaties with (Newark), XVII, *a* 380; South American (Acclimatization), I, *a* 85; subjugation of (United States), *b* 799; steel (Iron), XIII, *b* 352–53; summer (Canada), VI, *a* 682; swords (Iron), XIII, *b* 342.

Consulting the first reference ("volume XII, page 862") you will find an article of eleven pages in length, giving a concise account of the Indians, their physical traits, tribal divisions, customs, etc. The second reference ("American, I, 602") directs the reader to the article America, where there is a complete history of the aboriginal races, with still further notices of their habits, languages, religions, etc. The third reference ("literature of (Eliot), VIII, *a b* 128") directs attention to paragraphs under the article headed Eliot, John, which tell about the translation of the Bible and other books published in the Indian language. The remaining references may be found with equal facility, and are self-explanatory. After having consulted as many of these as you think necessary, you may still wish to learn the very latest facts relative to the status of the Indian tribes in the United States. Turning to the Index to the Supplements, see whether or not there are additional references of a similar character there. By turning to any articles that may be thus indicated, you will doubtless find all the information on this subject that you desire.

Any other subject may be studied in a similar way.

Now take the word Sea, or London, or Columbus, and find all the references to it given in the Index.

Whenever the word for which you are looking cannot be found in the first part of the Index, look for it in the second part, which relates to the Supplements; that is, to volumes XXV to XXIX.

Another important feature of the *Britannica*, and one which is not alluded to elsewhere in this Guide, is the Condensed Biographical Dictionary, appended to the last supplement volume, *i. e.*, Vol. XXIX.

Condensed Biographical Dictionary

For quick and ready reference this dictionary will often prove to be of great service. It is one of the most complete dictionaries of its kind ever published, containing the names of more than 25,000 persons, with their titles or vocations, and the dates of birth and death. Further particulars with regard to many (but, of course, not all) of these persons may be found by referring to the Index, which will point out the exact place in the *Britannica* where the desired information is given.

[The *Encyclopædia Britannica* is a work of reference, and much more; it is a collection of all histories, all biographies, all arts, all literatures, and all scientific, professional, and mechanical knowledge, presenting almost an embarrassment of riches. To the users it gives that satisfaction which one would naturally expect from such an authority. As a guide to vocations it is most helpful, as it will enable a boy to systematize his reading or his investigations, and thus, while economizing both time and labour, to reach the highest results. No one's education was ever finished in a school. We are all, to a greater or less degree, self-educated. A great deal of what the schools give us as knowledge may prove worthless, and will probably be allowed to drop from the mind as soon as we are left to ourselves. The better part of our education is that which we acquire independently—through reading, through observation, through intercourse with others—an ever-increasing stock of what is called "general information." The owner of the New Werner Twentieth Century Edition of the *Encyclopædia Britannica* will be enabled to pick out just that kind of information that will be of the greatest value to him in his calling, for there is hardly a trade, industry, or profession in the civilized world that is not treated in its pages. So, too, with the lad into whose hands it will fall. Hardly knowing what he seeks, he will find much that interests him, and almost unconsciously will acquire stores of knowledge that some future day he will find invaluable.]

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PART I

THE YOUNG PEOPLE

CHAPTER I

To the Boys and Girls

"Now, my young friends, this habit of reading is your pass to the greatest, the purest, and the most perfect pleasures that God has prepared for his creatures. But you cannot acquire this habit in your old age; you cannot acquire it in middle age; you must do it now, when you are young. You must learn to read, and to like reading, now, or you cannot do so when you are old."

—*Anthony Trollope.*

The Britannica

Allow me to introduce you, boys and girls, to the *Encyclopædia Britannica*. It is, without question, the greatest book of its kind that has ever been published in our language. Here we have it in over a score of huge volumes, with thousands of illustrations and hundreds of maps and diagrams. The amount of matter which it contains is so great that it would take you several years to read it through.

But it is not intended that anybody shall read it through. It would be extremely foolish for you to begin with the first page of the first volume, and try to read everything in the order in which it comes. It would be like sitting down at a table loaded with delicacies, and trying to eat everything, from the first dish to the last, without considering either your tastes or your needs. No person in his right senses would think of doing such a thing. You will readily understand, therefore, how important it is that you should know, at the very outset, what this famous book is, and how it ought to be used in order that it may be of the greatest possible assistance and value to you.

What is it?

What is an encyclopædia?

It is a book which treats of all the various kinds of knowledge. In other words, it is a book which contains some information concerning everything that can be learned by man in this life. If you could know the whole encyclopædia by heart, you would be a very learned person indeed. But, of course, this is impossible; and it would be very unwise for you to think of becoming a great scholar in that way. You do not want to make a walking encyclopædia of yourself.

How to use it

Does the carpenter carry his chest of tools around on his back while he is at work? Of course not. But he knows where the chest is, and he knows just where each tool is placed in it, so that he can lay his hands upon it in a moment, even though his eyes be shut. So it should be with your encyclopædia. You don't want to load your mind with the millions of facts which it contains, or burden your memory with the retention of them all. But you want to know your encyclopædia so well that, when it is desirable to lay hold of a certain fact, you can do so without

loss of time, and without unnecessary labor.

Again, among the great variety of tools which the carpenter has in his chest, there are some which he uses very often, there are others which he needs only on special occasions, and there are still others which, being required for only the very finest work, may not be called into use more than once or twice for years at a time. But it is necessary to have all these tools, and to know how to handle them, for there is no telling when they may be called for. And so it is with your encyclopædia. Some of its articles will be helpful to you day by day, as you carry on your studies at school or your work at home. Others are at present of no interest to you. Indeed, you will find not a few that are wholly incomprehensible to you. But that which is of no use to-day may be just the thing that you will need a year, two years, or five years from to-day; and the articles which you cannot now by any means understand may contain exactly what you will enjoy and be profited by when you are a little older. And so it will be a good thing at the outset to confine your inquiries and your readings to those subjects which are the easiest for you, and in which you will naturally be the most deeply interested.

Now, here are some curious things which you may like to read about. They have been selected at random from among hundreds of others that will from time to time be suggested to you.

Curious Things

The Bo-tree (the oldest tree in the world), IX, 135; XXV, 553.

The Banyan tree, III, 300.

Great trees of California, IV, 623.

The Upas tree, XXIII, 916.

Pygmies (famous little people of Africa), XX, 126.

Gipsies, X, 545. This is a long article, and a part of it may not be interesting to you; but you will certainly like to read the section which describes their modes of life, X, 549.

Magic mirrors, XVI, 524.

Poison rings, XX, 576.

Ancient bottles, IV, 152.

Great bells, XXV, 419.

Kites and Kite-flying, XXVII, 506.

Bracelets, IV, 169.

History of fans, IX, 25.

History of the American Flag, XXVI, 658.

Flags in ancient and modern times, IX, 241.

Holidays, XXVII, 302.

The sea serpent, XXI, 638.

Cataracts and waterfalls, XXVI, 85.

Quill pens for writing, IX, 53.

The great wall of China, XXVII, 160.

The thugs of India, XXIII, 348.

Wax figures, XXIV, 486.

Spinning in old times, XXIV, 766.

Egyptian, Greek, and Roman months, IV, 590.

Wild animals of India, XII, 779.

The roc (monster bird of the *Arabian Nights*), XX, 626.

The honey guide (a curious little bird), XII, 143.

The cockatrice, VI, 90.

The hunters and the glutton, X, 620.

The ichneumon, XII, 665.

The custom of April Fool, II, 187.

May-day customs in old times, XV, 654.

The Nile festival in Egypt, VII, 630.

The ordeal of fire in the Middle Ages, XVII, 843.

Deodands, VII, 87.

The divining-rod, VII, 255, and XI, 490.

The automaton, III, 123.

The hornbook, XII, 174.

The diving-bell, VII, 255–260.

Balloons, I, 169.

Heroes

Every young person likes to read about heroes and deeds of heroism. The *Britannica* tells of a great number. A very interesting course of reading may be made up from the following and similar subjects:

Leonidas, king of Sparta, who with 300 men defended a mountain pass against the entire Persian army, XIV, 463.

Cincinnatus, who was called from his plough to be dictator of Rome, V, 685.

Horatius Cocles, who defended the bridge across the Tiber, and thus saved Rome, VI, 92.

Regulus, the Roman who suffered death rather than break his word, XX, 361.

Arminius, or Hermann, the ancient German hero, X, 430.

The Cid, the national hero of Spain, V, 675.

William Tell, the mythical hero of Switzerland, XXIII, 171.

William Wallace, national hero of Scotland, XXIV, 347–48.

Arnold von Winkelried, the Swiss patriot, XXIV, 644.

Jeanne d'Arc, the heroine who saved France from the English, XIII, 706; IX, 485.

Captain John Smith, famous in the early history of Virginia, XXII, 183; XXIV, 280.

John III (Sobieski), the Polish hero, XIII, 725; XIX, 307.

Gustavus Adolphus, the Swedish Protestant hero, XI, 298–99.

Kosciusko, the Polish patriot, XIV, 143.

Andreas Hofer, the Tyrolese patriot, XII, 46.

Garibaldi, the Italian patriot, XXVII, 65.

Kings, Warriors, and Statesmen

Then there are scores of interesting articles about kings, warriors, and statesmen, some of which you will want to read. The following are examples:

Alexander the Great, I, 425.

Hannibal, the Carthaginian general, XI, 394.

Scipio Africanus, XXI, 488–89.

Julius Cæsar, the greatest of the Romans, IV, 562.

Marcus Aurelius, III, 75–78.

Stilicho, XXII, 578.

Belisarius, III, 462.

'Omar, XVI, 586.

Charles Martel, V, 370.

Charlemagne, V, 349–50.

Alfred the Great, I, 447.

William the Conqueror, XXIV, 606.

Richard Cœur de Lion, XX, 554.

Jenghiz Khan, XIII, 631–33.

Timur (Tamerlane), XXIII, 425–27.

William the Silent, XXIV, 614–15.

Akbar, I, 385.

Richelieu, XX, 559; IX, 500.

Cromwell, VI, 528–36.

Peter the Great of Russia, XVIII, 712.

Charles XII of Sweden, V, 364–66.

George Washington, XXIV, 408.

Napoleon Bonaparte, XVII, 199.

William Pitt, XIX, 143–59.

Wellington, XXIV, 521–27.

Nelson, XVII, 330–33.

Abraham Lincoln, XIV, 665–69.

Ulysses S. Grant, XXVII, 142.

Robert E. Lee, XIV, 400.

Count von Moltke, XXVIII, 122–23.

Prince Bismarck, XXV, 485.

William E. Gladstone, XXVII, 103.

Or, if you would read of explorers, travellers, discoverers, and adventurers, see such articles as these:

Hwen T'sang, XII, 434–35.
Marco Polo, XIX, 417.
Mandeville, XV, 480.
Ibn Batuta (14th century), XII, 642.
Prince Henry the Navigator, XI, 599.
Bartolommeo Dias, VII, 146.
Columbus, VI, 153.
Hernan Cortes, VI, 390–91.
Francisco Pizarro, XIX, 169.
Ferdinand Magellan, XV, 198.

Discoverers and Adventurers

John and Sebastian Cabot, IV, 552.
De Soto, VII, 114.
Sir Francis Drake, VII, 337.
Martin Frobisher, IX, 695.
Vasco da Gama, X, 52.
Henry Hudson, XII, 346.
Captain Kidd, XXVII, 495.
Captain Cook, VI, 294.
African Explorations, I, 219.
David Livingstone, XIV, 726–29.
Henry M. Stanley, and the recent discoveries in Africa, XXIX, 149.
Arctic Explorations and Discoveries, XIX, 327–43; XXVIII, 448.
Sir John Franklin, IX, 633.
Australian Explorers, III, 91.

Then aside from this mere reading for pleasure or ordinary information, you will want to learn from time to time how a great many things are done. The *Britannica* will help you. For example, notice the following:

How to do Things

How to make liquid glue, X, 120 a.
How to do cold gilding, X, 530 b.
How to tie knots, XIV, 129 a.
How to make gold lacquer for brass work, XIV, 195 a.
How to make snow-shoes, XXII, 213 a.
How to make pantographs, XVIII, 218.
How to make photographs, XXVIII, 410.
How to do sleight-of-hand tricks, XIV, 415.
How to collect butterflies, IV, 531 b.
How to make putty, XX, 124.
How to build an ice-house, XII, 650 a.
How to shoe a horse, XXI, 870–71.
How bells are made, III, 463.
How matches are made, XV, 631.
How to do with a magic lantern, XV, 212.
How nets are made, XVII, 367.
How to make flies for trout fishing, II, 37.
How pins are made, XIX, 106.
How a marble statue is made, XXI 598.
How to make a canoe, IV, 716.
How to rig a ship, XXI, 621.
How to care for hunting hounds, XII, 328.
How to make bows and arrows, II, 328 b.
How to catch fish with a hook, II, 32.
How to make a bull-roarer, XXV, 641.
How carrier-pigeons are trained, XXVI, 72.

And now do you not begin to see what a vast amount of entertaining and useful knowledge lies before you in these volumes, ready for you to use when you choose?

In the chapters that are to follow, an effort will be made to classify a few of the subjects which will be of most interest to you. In this way the GUIDE hopes to help you to a still further and more intimate acquaintance with the contents of the *Britannica*. If you once acquire the habit of consulting it, you will find it a trustworthy friend, ready to answer your questions and willing to help you on all occasions.

The Index volume of the *Britannica* will be of great assistance to you in making references to any of the other volumes. When you want to find out anything about a given subject, it is often a good plan to turn at once to that volume. If you do not know how to use the Index, refer now to pages XII and XIII of this GUIDE, and read the directions given there.

CHAPTER II

HOME READINGS IN HISTORY

"The use of reading is to aid us in thinking."—*Edward Gibbon.*

TO KNOW one thing well is better than to have a smattering of many things. It is an excellent plan to choose for yourself some particular subject which you like, and then to follow a systematic course of reading on that subject until you have acquired a comprehensive knowledge of it. Some of you will prefer history, some of you biography (which is really a branch of history), some of you science, and some of you art. In beginning such a course read that which you can readily understand; you will gradually become able to understand and enjoy things which now seem very hard or totally unintelligible to you. It is not intended that a course of this kind should take the place of the miscellaneous reading which you will want to go through—of the stories, poems, sketches, the many excellent and beautiful things in literature which every intelligent boy or girl takes delight in reading. The object of this course is to add to your knowledge, to aid you in thinking, to help you to become an intelligent man or woman. Having once decided to begin it, resolve that nothing shall induce you to neglect it. Devote a little time to it regularly. If you give ten minutes every day to systematic reading—and you need not give more—you will be astonished at the end of a year to note how many things you have learned. If you find the reading pretty difficult now and then, you must not give up on that account. The hardest reading is often the most profitable—provided always that we make ourselves masters of it.

Courses of Reading

A great many articles in the *Britannica* may be utilized in courses of reading of this kind. If the *Britannica* is the only book to which you have access, these articles may be made to comprise a complete course in themselves. But if there are at hand other books on the same subject, then the readings from the *Britannica* may be made to supplement your study of these other authorities. For instance, let us suppose that you have undertaken to learn all you can about United States history. Perhaps you have studied a text-book on that subject at school. Did it seem dull and dry to you? Perhaps the writer has made it so by trying to compress a great amount of information into a very small space. He has given a large

number of dates and names, and you have been expected to learn these and remember them.

But history is a good deal more than dates and names. It is a fascinating story, and people read it because of the pleasure which it gives no less than for the profit which may be derived from it. Take now your school history and supplement the lessons which it contains with readings from the following articles in the *Britannica:*

What is History?

The story of Columbus, VI, 153.

The life of Cortes, the conqueror of Mexico, VI, 390.

Discoverers and Colonists

The life of Pizarro, the conqueror of Peru, XIX, 169; and a particular account of his exploits in Peru, XVIII, 690.

The life of Balboa, the discoverer of the Pacific Ocean, III, 236; and a particular account of his great discovery, X, 163.

The life of De Soto, the discoverer of the Mississippi, VII, 114.

The life of Sir Francis Drake, the first Englishman who sailed round the world, VII, 337.

The life of Sir Walter Raleigh, the great admiral, statesman, and courtier, XX, 274.

The life of Captain John Smith, who figures so prominently in the story of the settlement of Virginia, XXII, 183.

The story of Pocahontas, the Indian princess, XXII, 185.

The story of the Pilgrim Fathers, XII, 764.

The account of the Dutch settlers in New York, XVII, 466.

The life of William Penn, the Quaker founder of Pennsylvania, XVIII, 502.

The story of Marquette, the French explorer, XV, 572.

The life of La Salle, who rediscovered the Mississippi, XIV, 319.

The story of Pontiac, the Indian chief. XVIII, 514.

The life of General Wolfe, the hero of Quebec, XXIV, 664.

Great Americans

The life of Washington, XXIV, 408.

The life of Franklin, America's first philosopher, IX, 626.

The life of Patrick Henry, XI, 602.

The life of John Adams, I, 129.

The life of Thomas Jefferson, XIII, 624.

The story of the Declaration of Independence, XXIII, 785.

The life of Lafayette, XIV, 202.

The life of General Greene, XI, 146.

The story of Benedict Arnold, XXIII, 785.

The life of Cornwallis, VI, 379.

An account of Aaron Burr, XI, 369.

The life of Alexander Hamilton, XI, 368.

And now, if you wish to continue your historical readings to the present time, you may do so by reading the biographies of the Presidents who have not been named in the list above:

The Presidents

James Madison, XV, 183.
James Monroe, XVI, 787.
John Quincy Adams, I, 130.
Andrew Jackson, XIII, 543.
Martin Van Buren, XXIV, 63.
William H. Harrison, XI, 442.
John Tyler, XXIII, 717, 802.
James K. Polk, XIX, 415; XXIII, 804–5.
Zachary Taylor, XXIII, 102, 805–7.
Millard Fillmore, IX, 144; XXIII, 807.
Franklin Pierce, XIX, 90; XXIII, 808.
James Buchanan, IV, 371.
Abraham Lincoln, XIV, 665; XXIII, 812, 813, 814, 815–819.
Andrew Johnson, XIII, 729; XXIII, 819.
Ulysses S. Grant, XXIII, 817 18; 820–23; also XXVII, 142.

Rutherford B. Hayes, XXIII, 823–4; also XXVII, 261.

James A. Garfield, XXVII, 65.

Chester A. Arthur, XXV, 256.

Grover Cleveland, XXVI, 197.

Benjamin Harrison, XXVII, 237.

William McKinley, XXVII, 673.

By the time you have read all these biographies you will have acquired such a knowledge of American history as will be of value to you as long as you live. But to some of you this course may seem hard, dry reading. If so, it will be no trouble to suggest another—a very different one, which all boys who are fond of the sea and not afraid of a little history will turn to with pleasure.

NAVAL HISTORY.

Ships in former times were very different from those which sail the sea nowadays. Read of the first invention of boats and ships in volume XXI, page 840. Among the earliest war-ships of which we have any account are the Greek and Roman triremes, described on page 843 of the same volume. In the article on the NAVY, XVII, 287, there is an interesting account of the early war-ships used by the English. King Henry VIII is said to have laid the foundation of the British navy, and the largest ship of his time, the *Great Harry*, is described, XVII, 289. Queen Elizabeth called together the greatest naval force that had ever been known, in order to oppose the Invincible Armada of Spain. The story of the ARMADA and of its notable defeat is told in an interesting article on page 476 of volume II. And in this connection you will want to read about Sir Walter Raleigh, XX, 274, about Sir Francis Drake, VII, 337, and about Sir John Hawkins, XI, 478. This series may be supplemented by a reference to Robert Blake, the English admiral of the Commonwealth, III, 697–98.

Ships

But it is not expected that this course of reading will be exhaustive; so you may turn now to the life of Nelson, XVII, 330; to the battle of the Nile, I, 53; and to the battle of Trafalgar, VI, 131; and then to the life of Admiral Cochrane, Lord Dundonald, VII, 465–67.

Next, read about our own naval heroes:

Paul Jones, XIII, 748.

Commodore Decatur, XXIII, 795; also XXVI, 377.

Commodore Perry, XXVIII, 389–90.

Admiral Farragut, IX, 37.

Admiral Dewey, XXVI, 407; XXVIII, 14.

Finally, by way of concluding this brief course of reading, you will find it profitable to learn all that you can about the UNITED STATES NAVY, XVII, 287, and particularly our new navy, its wonderful armament and its estimated strength, XXVIII, 180–88.

THE ROMANCE OF HISTORY.

1. There are many things connected with the history of the Middle Ages which give to it the charm of romance. We never tire of reading about the KNIGHTS of chivalry, XIV, 112; about the CASTLES in which they lived, V, 171; about the TOURNAMENTS which they held, XXIII, 520; and about the CRUSADES in which they engaged, VI, 549.

Tales of Knighthood

Next, let us read the legend of Roland, the peerless knight of France, XX, 641; the history of Richard the Lion-hearted, XX, 554, and particularly of his exploits in Palestine, VI, 555; the story of the English outlaw, Robin Hood, XX,

621; the account of Godfrey of Bouillon, VI, 551; the history of the Children's Crusade, VI, 554; that of Edward the Black Prince, VII, 595; that of Bertrand Du Guesclin, VII, 447; and finally, the story of Chevalier Bayard, the knight "without fear and without reproach," III, 395.

When you have mastered this course of reading, you will have a better knowledge of mediæval life and manners and traditions than you could ever have acquired merely by studying an ordinary text-book at school.

2. A second course—equally interesting, but somewhat harder, and therefore suited to older readers—may be taken from ROMAN HISTORY.

Stories of Rome

Read the legendary story of Romulus, the reputed founder of the city, XX, 852; the mythical tale of the Horatii and Curiatii, XII, 169; the account of Horatius Cocles, the hero who kept the bridge, VI, 92; of brave Regulus, who never broke his word, XX, 361; of Camillus, who saved the capitol of Rome from the Gauls, IV, 656; XX, 759; of Cincinnatus, called from his plough to defend his country, V, 685; of Cornelia, the mother of the Gracchi, VI, 373; of the Gracchi themselves, and of their services to their country, XI, 23; of Hannibal, the Carthaginian hero, XI, 394; of his conqueror, Scipio Africanus, XXI, 488–89; of Cæsar, IV, 562, and Pompey, XIX, 465, and the downfall of the Roman republic, XX, 781.

3. The third course is not historical, but mythical or legendary, and yet there is doubtless some sort of historical basis for it. It relates to the story of the TROJAN WAR, an event immortalized by Homer, the first of the poets, and made the subject of many a tale and poem and tragic drama from his time until now. As the basis and starting point of this course, read the Legend of Troy, XXIII, 619; then refer to the following articles in their order:

Story of Troy

Paris, whose perfidy was the cause of the war and the ultimate ruin of his country, XVIII, 301.

Helen of Argos, the most beautiful woman in the world, XI, 561.

Menelaus, the wronged husband of Helen, XVI, 14.

Agamemnon, "king of men" and leader of the Grecian forces, I, 244.

Odysseus, the wily hero, chief actor in Homer's Odyssey, XVII, 749.

Penelope, wife of Odysseus, XVIII, 501.

Achilles, whose wrath and its consequences form the subject of the Iliad, I, 89.

Hector, the bravest and ablest of the Trojan chiefs, XI, 544.

Ajax Telamon and Ajax Oïleus, typical heroes and leaders of the Greeks, I, 383.

And now, if you have become interested in stories of this kind, turn to Chapter XX in this GUIDE and find there an extensive list of Greek legends and other romantic tales, all of which are narrated with more or less fulness in the pages of the *Britannica*.

CHAPTER III

Home Readings in Biography

"Lives of great men all remind us,
We can make our lives sublime,
And, departing, leave behind us
Footprints on the sands of time."

—*Longfellow.*

The biographies of great, and especially of good men, will always be found instructive and useful to the young. Some of the best are almost equal to gospels. They teach right living, high thinking, and energetic action. They show what is in the power of each to accomplish for himself. No young man can rise from the perusal of such lives without feeling his whole mind and heart made better, and his best resolutions strengthened. They increase his self-reliance by fortifying his views and elevating his aims in life. Sometimes, too, a young man discovers himself in a biography, as Correggio felt within him the risings of genius on contemplating the works of Michel Angelo. "And I, too, am a painter!" he exclaimed. Benjamin Franklin was accustomed to attribute his usefulness and eminence to his having in youth read a work of Cotton Mather's. And Samuel Drew avers that he framed his own life, and especially his business habits, on the model left on record by Benjamin Franklin. Thus, it is impossible to say where a good example may not reach, or where it will end, if indeed it have an end.

Uses of Biography

But, to be more precise, it may be well to name a few biographies that will illustrate the more desirable elements of character. For instance, the most striking lessons of

DILIGENCE, APPLICATION, AND PERSEVERANCE

are to be found in the lives of certain famous men about whom no one can afford to be ignorant. Read, therefore, the following biographical sketches:

Men of Diligence

Benjamin Franklin, the studious printer's apprentice, who became the first philosopher of America, IX, 626.

Washington Irving, the "father of American literature," XIII, 383.

Arthur Wellesley, Duke of Wellington, the leader of the victorious armies at Waterloo, XXIV, 521.

Michael Faraday, the distinguished scientist, IX, 27.

James A. Garfield, the canal-boy, who became President of the United States, XXVII, 65.

Richard Cobden, the English political economist and reformer, VI, 78.

Hugh Miller, the stonecutter of Cromarty, who attained distinction in both science and literature, XVI, 330.

Sir Isaac Newton, the son of a small farmer, who through his industry became the foremost mathematician and astronomer of modern times, XVII, 449.

Buffon, the French naturalist, who declared that "genius is patience," and whose rule was to turn every moment to account, IV, 397.

Dr. Jenner, the discoverer of vaccination, XIII, 633; XXIV, 28.

Daguerre, the inventor of the daguerreotype, and the real founder of the art of photography, VI, 671.

Gainsborough, the son of a clothworker, who became one of the greatest of English painters, X, 15.

General Grant, who rose from obscurity to be one of the most successful military leaders of modern times, XXVII, 142.

Then there have been men who, in the face of

POVERTY, SICKNESS, OR DISASTER,

won their way to success and distinction. Read the story of their lives, and learn that, to the boy or man of determination and will, there is no such thing as failure. Among scores of such men, it is necessary to mention only a few.

Men of Determination

Palissy, the potter, whose life reads like a romance, XVIII, 190.

Galileo, who continued his scientific pursuits even after blindness and old age had come upon him, X, 28.

Elihu Burritt, "the learned blacksmith," who, in the odd moments of his business, made himself the master of forty languages, XXV, 657.

Thomas Carlyle, the son of a mason, who, by his own perseverance, became one of the most famous men of modern times, XXVI, 64.

John Bunyan, who wrote the "Pilgrim's Progress" while in prison, and at the same time supported his family by making tag laces, IV, 470.

Sir Richard Arkwright, who worked his way from a barber's shop to be the inventor of the spinning jenny and the founder of the cotton industry in Great Britain, II, 474.

Samuel Drew, who rose from the shoemaker's bench to be a distinguished essayist and preacher, VII, 405.

Sir Humphry Davy, the distinguished chemist, who worked his way up from the position of a country apothecary, VI, 743.

George Stephenson, the colliery engine-man, who invented the railway locomotive, XXII, 564.

Matthew Boulton, "the father of Birmingham," IV, 157; XXIV, 435.

Andrew Johnson, the tailor's apprentice, who became President of the United States, XIII, 729.

For examples of

ENERGY, PROMPTITUDE, AND HARDIHOOD,

look into the biographies of such men as the following:

Men of Energy

Napoleon Bonaparte, XVII, 199.

Peter the Great, XVIII, 712.

Saladin, XVI, 610.

Francisco Xavier, XXIV, 752.

Lord Clive, VI, 9.

Oliver Cromwell, VI, 528.

Andrew Jackson, XIII, 543.

Robert E. Lee, XIV, 400.

Henry M. Stanley, XXIX, 149.

For interesting illustrations of the manly qualities of

PATIENCE AND FORTITUDE UNDER REVERSES,

study the lives of such noted men as

Men of Patience

Christopher Columbus, VI, 153.

John Hampden, the English patriot, XI, 383.

Dante, the great Italian poet, VI, 712.

Sir Walter Raleigh, XX, 274.

Louis Kossuth, the Hungarian patriot, XXVII, 517.

James Watt, the inventor of the steam engine, XXIV, 433.

James Audubon, the famous American ornithologist, III, 62.

Sir Austen H. Layard, the discoverer and excavator of the ruins of Nineveh, XXVII, 560.

William Harvey, the discoverer of the circulation of the blood, XI, 448.

Claude Lorraine, the pastry-cook's apprentice, who became one of the greatest landscape painters of France, V, 711.

John Flaxman, the famous English sculptor, IX, 260.

If you would like to read of pleasant instances of

CHEERFULNESS AND EQUANIMITY OF TEMPER

under every variety of fortune, turn to the lives of men like

Men of Cheerfulness

Dr. Samuel Johnson, XIII, 730.
Oliver Goldsmith, X, 676.
Sydney Smith, XXII, 186.
Lord Palmerston, XVIII, 197.
Abraham Lincoln, XIV, 665.

Very interesting and valuable also are those lessons of

INTEGRITY AND UPRIGHTNESS OF PRINCIPLE

that are shown in the careers of

Men of Integrity

Diogenes, the Greek philosopher, VII, 214.
Edmund Burke, the Anglo-Irish orator, IV, 481.
Dr. Thomas Arnold, head master of the school at Rugby, II, 547.
Sir Thomas More, the English statesman, XVI, 842.
John Howard, the philanthropist, XII, 333.
William Chambers, the Scottish publisher, V, 330.
Loyola, the founder of the society of Jesuits, XV, 32.
William Wilberforce, the opponent of the slave trade, XXIV, 596.
"Stonewall" Jackson, the Confederate general, XIII, 544.

If you would learn of the rewards which follow

METHOD, PRECISION, AND PAINSTAKING,

read the biographies of

Men of Precision

Nicolas Poussin, the French painter, XIX, 669.
Michel Angelo, the great Italian artist, XVI, 237.
Baron Cuvier, the French naturalist, VI, 653.
Titian, the Italian painter, XXIII, 441.
William Wordsworth, the poet of nature, XXIV, 703.
Lord Brougham, lord chancellor of England, IV, 335.
Alexander Pope, XIX, 496.
William Cecil, Lord Burghley, Queen Elizabeth's prime minister, V, 246.
Benjamin Disraeli, Lord Beaconsfield, VIII, 328; XXV, 395.

And for the supreme lessons of purity of life and

NOBILITY OF MOTIVE

examine the lives of such men as

Men of Noble Motives

Abraham Lincoln, XIV, 665.
General Lafayette, XIV, 202.
William Lloyd Garrison, X, 78.
Horace Greeley, XI, 143.
John G. Whittier, XXIX, 545.

and other illustrious persons of our own and foreign lands.

Some we have here named might be catalogued, indeed, as types of every excellence that should adorn human character. Such are our own Washington and Benjamin Franklin; but even the youngest student will see how hard it is to attempt a biographical classification on these lines.

Most boys are ambitious. They wish to grow up to become men of influence

and renown. Many of them lose this ambition because they are unwilling to wait long enough, work hard enough, and be sufficiently patient in well-doing.

"The heights by great men reached and kept
Were not attained by sudden flight."

And yet there have been many great men who displayed their abilities at a very early age. Perhaps you would like to read about some of these

GREAT YOUNG MEN.

Handel composed a set of sonatas when he was ten years old, XI, 387.

Musicians

Haydn composed a mass at thirteen, XI, 481–83.

Mozart composed his first opera at twelve, XVII, 14.

Beethoven's music was beaten into him, but he composed three sonatas when thirteen, III, 435.

Cherubini composed a mass at thirteen, V, 510.

Paganini was a great violinist at eight, XVIII, 138.

Charles Wesley, the great hymn writer, played the harpsichord when he was a babe, XXIV, 532.

Schubert, the greatest of song-writers, began to compose at the age of thirteen, and died when only thirty-one, XXI, 479.

Michel Angelo finished his great marble statue of "David" before he was twenty, XVI, 237.

Raphael was an eminent painter at seventeen, XX, 286.

Artists

Canova modeled a lion out of butter when only four years old, V, 22.

Sir Edwin Landseer painted one of his greatest pictures at sixteen, XIV, 280.

Cervantes had written several romances before he was twenty, V, 302.

Goethe could write in five languages when he was eight, X, 643.

Victor Hugo wrote his first tragedy when fifteen years old, IX, 594.

Alexander Pope wrote his *Pastorals* when only sixteen, XIX, 496.

Authors

Chatterton, who died before he was eighteen, was already a great poet, V, 385.

Burns began to rhyme at sixteen, IV, 505.

Thomas Moore wrote verses at thirteen, XVI, 831.

Shelley published *Queen Mab* when eighteen, XXI, 826.

Southey wrote *Joan of Arc* when nineteen, XXII, 303.

Mrs. Browning wrote poems at ten, IV, 351.

Tennyson wrote his first volume of poems before he was eighteen, XXIX, 251.

Sir Isaac Newton displayed wonderful ability when a mere child, XVII, 449.

Philosophers

Blaise Pascal wrote a treatise on Conic Sections when he was sixteen, XVIII, 339.

Grotius wrote Latin verses when he was eight, XI, 193.

Haller composed a Chaldee grammar at twelve, XI, 354.

Lord Bacon planned his *Novum Organum* before he was sixteen, III, 173.

Sir Christopher Wren invented an astronomical instrument at thirteen, XXIV, 724.

William Pitt, the younger, entered Parliament when he was twenty-one, XIX, 143.

These were some of the great young men of modern times. Ancient history furnishes us with other examples of men to whom

SUCCESS CAME EARLY IN LIFE:

Young Warriors, etc.

Themistocles, who won his greatest victory at the age of thirty, XXIII, 269.

Alexander the Great, who died at thirty-one, I, 420.

Pompey, who was a successful Roman general at twenty-three, XIX, 465.

Hannibal, who, when only twenty-six, was made sole commander of the Carthaginian army, XI, 394.

Charlemagne, who was master of France and Germany at thirty, V, 349.

Marshal Saxe, who began his military career at twelve, XXI, 361.

Charles XII of Sweden, who became king at the age of fifteen, V, 364.

William Pitt, the younger, who became premier at the age of twenty-four, XIX, 143.

This list might be easily extended; but here is reading enough for several winter evenings. And when you have finished it, you will be at no loss to determine whether these men attained distinction at a single bound or whether they did not rather win by hard and patient labor, begun while they were very young. Greatness comes to no man simply because he wishes it. It is the reward of determined effort.

CHAPTER IV

Home Readings in Science

"To neglect all the abiding parts of knowledge for the sake of the evanescent parts is really to know nothing worth knowing."

—*Frederic Harrison.*

The subject of history is not equally attractive to all young people. There are some who would prefer to read of the great world of nature, and for these it would be easy to name very many *Britannica* articles which would prove interesting and instructive. Now, here is a course of readings in natural history, arranged in twelve divisions, each of which can be easily completed in a month. You will find some of the articles very interesting indeed, while others, perhaps, will seem rather hard and at first not so easy to understand. But if you begin on this course and hold to it for a year, you will find not only that you have gained a great deal of information, but that the reading of these various articles has increased your capacity for deriving the highest pleasure from the perusal of books.

Natural History

READINGS IN NATURAL HISTORY.

I. MAMMALS.

The Elephant, VIII, 116.
The Giraffe, X, 552.
The Beaver and its habits, III, 410.
Monkeys, II, 130.
The Tiger, XXIII, 411.
The Bear, III, 398.
The Bison, III, 688.
The Wolf, XXIV, 662–63; XV, 444.

II. CURIOUS BIRDS.

The Albatross, the famous bird of the South Seas, I, 398.

The Dodo, a strange bird now no longer in existence, VII, 278.
The Cormorant, how it is taught to catch fish, VI, 361.
The Dove, VII, 328.
Migration of Birds, III, 662.
The Nightingale, XVII, 511.
The Stork, XXII, 605.

III. FISHES.

The Shark, XXI, 810.
The Swordfish, XXII, 842.
Mackerel, XV, 160.
Codfish, VI, 95.
Cuttlefish, VI, 648. Goldfish, X, 675.

IV. REPTILES.

Special article, XX, 444.
Rattlesnake, XX, 305.
Cobra, VI, 83. Anaconda, I, 691.
Boa Constrictor, III, 731.
Tortoise, XXIII, 484 (illustrated).
Crocodile, VI, 524. Alligator, I, 515.
The Chameleon, V, 331.

V. INSECTS.

Habits of Ants, II, 84 a.
Slaveholding Ants, II, 86.
White Ants of S. America, II, 88 a.
Bees and their Habits, III, 417 b.'''
An interesting description of Spiders, II, 261.
The Mantis, the curious "subject of many widespread legends," XV, 510.

VI. EXTINCT ANIMALS.

The Mammoth (illustrated), XV, 454.
The Megatherium (illustrated), XV, 837.
The Plesiosaurus, XIX, 232.
The Pterodactyl, XX, 90.

VII. FABLED ANIMALS.

The Dragon, VII, 333.
The Cockatrice, VI, 90.
The Griffin, XI, 174.
The Chimæra, V, 544.
The Phœnix, XVIII, 823.
The Sphinx, XXII, 413.
The Centaur, V, 295.
The Satyr, XXI, 336.
The Roc, XX, 626.

VIII. DOMESTIC ANIMALS.

History of the Horse, XII, 176.
The Arabian Horse, II, 209.
The Camel, IV, 650.
Dogs (an illustrated article), VII, 281.
Cats, V, 178.
The Cow, I, 346.

IX. SEA ANIMALS.

Life in the Ocean, VII, 240–244.
Whales and whale fishing, XXIV, 551; XV, 395.
Seals and seal fishing, XXI, 607.
The Walrus (illustrated), XXIV, 357.
The Dolphin, VII, 300.
Corals, VI, 326.

X. COMMON INSECTS.

The Housefly, XII, 330.
The Humble-bee, XII, 356.
Beetles, VI, 114.
Gnats, X, 624.
Mosquitoes, XVI, 894.
Butterflies, IV, 527.

XI. BARNYARD FOWLS.

Chickens, IX, 434.
Turkeys, XXIII, 699.
Geese, X, 691.
Ducks, VII, 436.
Pigeons, XIX, 93.
Eggs of Birds, III, 669.

XII. MISCELLANEOUS.

Special article on birds, III, 604.
Special article on insects, XIII, 147.
Animals of Asia, II, 607.

Animals of Africa, I, 231.
Animals of America, I, 598.
Article on Amphibia, I, 657.

Of course this list might have been made very much longer, for the *Britannica* contains hundreds of such articles; but the above will be sufficient to start with. As you proceed with your reading, other subjects will naturally suggest themselves, which you will be able to find from the Index volume without any further help from the GUIDE.

CHAPTER V

GAMES, SPORTS, AND PASTIMES

"Up! up! my friend, and quit your books,
Or surely you'll grow double:
Up! up! my friend, and clear your looks;
Why all this toil and trouble?"—*Wordsworth.*

THIS would be but a dull world if everybody worked all the time, and never took any recreation. And the *Encyclopædia Britannica* would be a dull book if it were filled entirely with information about the different branches of scientific knowledge, and said nothing about the games, sports, and pastimes which amuse our leisure hours and add to the enjoyableness of life. But from these volumes you can learn how to play as well as how to work. Every game of any importance, every pastime that is of general interest, receives its proper notice.

Work and Play

OUTDOOR GAMES.

The game of BALL has been a favorite pastime of all ages and nations. Read the article on that subject, XXV, 334.

Do you want to know all about BASEBALL, its history, the rules which govern the game, etc.? Turn to volume III, page 350, and you will find there a brief but comprehensive article on that subject, which every boy will want to study; and this is continued in a supplementary article, XXV, 377, which gives a complete history of the game since its first introduction in 1857 to the present time. In this latter article will be found the rules which govern its playing in America.

Games of Ball

The English national game of CRICKET is treated with equal fulness in VI, 511. See also William G. Grace, XXVII, 134. The leading articles on both cricket and baseball contain not only the rules most generally recognized for the government of the games, but carefully drawn diagrams of the fields, and full directions for playing.

Next to baseball, football claims the greatest attention in this country. Indeed, it would be difficult to say which is the leading favorite. The article on FOOTBALL, XXVI, 674–77, contains the very latest rules regulating this exciting game. A history and general notice of football as it was formerly played may be found in IX, 321.

ARCHERY is the subject of an extremely interesting article, II, 325.

From that article you may learn not only the history of bows and arrows, but how to make them (II, 328), and also the rules which govern the popular pastime of archery (II, 330).

Outdoor Games

Other outdoor games of almost every kind are described with like completeness:

Golf, X, 680.
Lacrosse, XIV, 195.
Bowls, IV, 162.
Croquet, VI, 537 b.
Quoits, XX, 195.
Curling, VI, 629.
Rackets, XX, 216.
Polo, XIX, 417.
Tennis, XXIII, 195.
Lawn Tennis, XXIII, 198–99.
Badminton, III, 196.

INDOOR GAMES.

All kinds of indoor games are also described, together with minute directions for playing them. The article on CHESS, V, 514, is interesting for its historical information. The modern changes of style in playing chess are noted in XXVI, 141. The article on DRAUGHTS (commonly known in this country as checkers), VII, 384, and that on BACKGAMMON, III, 170, are equally entertaining and instructive. Then there are the various games at cards, all of which are described in the *Britannica*.

Indoor Games

Casino, XXVI, 80.
Bezique, III, 539.
Cribbage, VI, 509.
Ecarté, VII, 536.
Euchre, VIII, 574.
Loo, XV, 3.
Napoleon, XVII, 235.
Piquet, XIX, 122.
Poker, XIX, 294.
Whist, XXIV, 573.

Among other indoor pastimes we may mention Riddles, XX, 564.

Legerdemain, or sleight of hand, XIV, 415; XV, 207.

Billiards, III, 583–86.

Bagatelle, III, 198.

Ten-pins, IV, 164.′′′

See amusements in this GUIDE, p. 235.

SPORTS.

Few sports are more attractive to boys and men than fishing; and to all who are partial to this kind of amusement, the article on ANGLING, II, 30, will prove both interesting and instructive. It contains a great deal of information about fish and the art of taking them with hooks. The life of quaint old Izaak Walton, the most famous of anglers, should be read in this connection, XXIV, 362.

Fishing

Most boys, even though they are debarred from such sports themselves, like to read about hunting; and so they will derive much pleasure from the general article on that subject, XII, 408. Here, too, they may learn about the care of foxhounds, XII, 328; about fox-hunting, XII, 410; and about horsemanship in the chase, XII, 199. There is more of the same kind of reading in VII, 285, 287, where a good deal of information is given about sportsmen's dogs, such as the pointer, the setter, and the retriever.

Hunting

Closely related to these sports are the pleasant pastimes of rowing and sailing on the water. Several articles now claim our attention. As for rowing, read what is said further on that subject in XXI, 35. An account of intercollegiate boat-racing is given in XXVIII, 626. The article on canoeing, IV, 716, is full of practical information. Row-boats are described further over, in XXI, 864. The articles on YACHTING, XXIV,

758–61, and YACHT-BUILDING, XXIX, 614, are very complete, and are full of historical interest. Practical directions for swimming and diving are given in XXII, 806, and these will repay you for all the time spent in their study. Skating, XXII, 112, is another instructive and interesting article.

Rowing, etc.

Everybody, nowadays, rides a bicycle; and so everybody will want to read its history, III, 575. A complete description of bicycle manufacture in the United States may be found in XXV, 465–67. The laws regarding bicycles and bicycle riders are noticed in XXV, 468. Then in XXVII, 561, there is a brief history of the organization called the League of American Wheelmen, which every bicycler will read. What bicycles have done for good roads is related in XXVIII, 599.

ATHLETIC SPORTS, ETC.

While learning about the games and sports of our own times it is but natural that we should wish to know how the people of former ages amused themselves, how they trained their bodies, and cultivated their strength. Here then, to begin with, are a few of the many articles or parts of articles relating to this subject:

In Greece and Rome

Greek games, X, 57; Olympian games, XXVIII, 287. The revival of these sports at Athens in the summer of 1896 lends much additional interest to the chapters describing them. Read then the following additional references to the Olympian games, V, 617; VIII, 131; XI, 85; XVII, 787.

Athletæ, III, 12.
Gymnasium, XI, 310.
Roman games, X, 59.
Gladiatorial games, X, 563.
Secular games at Rome, XXI, 649.
The Amphitheatre, I, 679; XX, 851.
The Colosseum, II, 367.
Roman circus, V, 691; XX, 849.
Chariot races, X, 58.
Wrestling, X, 58.

In the Middle Ages the most popular of all amusements were those connected with tournaments, the history of which is pleasantly narrated in XXIII, 520. The knights who engaged in these contests at arms often found amusement of a lighter character in following the chase in the manner described in XII, 409. The rearing and training of hawks for hunting purposes was called *falconry*, and this is the subject of an interesting article in IX, 7–12.

Athletic Training

And now, approaching our own times, read the two articles on Athletic Sports, III, 12, and XXV, 285. Both are full of valuable information, especially regarding physical culture. They are so full and exhaustive that some of the youngest readers may not care to read them through; and yet it will pay to get as many useful hints and suggestions from them as you can.

The article on Athletic Training and Apparatus, in the Supplements, presentsthe very latest facts and the opinions of the best authorities on this subject.

The article on Gymnastics, XI, 311, presents some interesting statements with reference to the training of the body by systematic exercises. The best methods of dieting while attempting to improve one's strength by physical training are adequately described in VII, 174.

See, now, Calisthenics, XXVI, 20, and Delsarte System, XXVI, 391.

PART II

THE STUDENT

CHAPTER VI

Three Courses of Reading in History

"History is philosophy teaching by examples."—*Bolingbroke.*

The entire history of man, from the earliest times to the present, will be found in the *Encyclopædia Britannica.* Many of the articles on historical subjects are chiefly valuable for purposes of reference, while others are extremely interesting when read in course, and if taken up and studied systematically will give to the student a mastery of the subject which he could not well acquire from any similar work.

It is proposed in this chapter to indicate three distinct courses of reading, any one of which can be pursued independently of the others. In laying out these courses the aim has been to select from the great abundance of material in the *Britannica* such portions as are essential to an understanding of the march of events, and to pass lightly over those periods of history which have been unprolific of events of general and permanent interest.

I. AMERICAN HISTORY.

Ancient America

The article America, I, 587, contains a section of twenty pages devoted to ancient America. This will serve as an excellent introduction to the course of study upon which we have entered. Here you will find a full account of the aborigines, page 602; their languages, page 604; their tribal organization, page 606; the ancient remains of the Mississippi valley and other localities, page 607; an account of the native civilization, page 609; and a very interesting résumé of the curious traditional history of Central America. In the articles Mexico, XVI, 214, and Yucatan, XXIV, 795, there is a still fuller exposition of this subject. In the article Peru, XVIII, 682, the remarkable civilization of the country of the Yncas (Incas) is described in a manner both pleasing and instructive.

The Discovery

It is still, in certain respects, a debated point as to who was the real discoverer of America. In the article America, I, 619, a full account is given of the voyages of the Northmen to the shores of North America, and following this we have the story of Columbus and his discoveries. Turn now to the biography of Columbus, VI, 153. Read, also, the life of Sebastian Cabot, IV, 552, and that of Amerigo Vespucci, XXIV, 208, who, by a singular fortune, gave his name to the New World. The conquest of Mexico is well told in the article Cortes, VI, 390, and that of Peru in the article Pizarro, XIX, 169.

THE UNITED STATES.

General Views

Begin with the article United States, XXIII, 777. The first part of this article, containing sixty pages embraces a history of our country which is not only more complete, but far more readable than most of the school text-books on this

subject. To add to the value of the article, it is illustrated with several maps:

1. A map of the English colonies.

2. A map showing the territorial growth of the United States from 1776 to 1887.

3. A map of the United States corrected to date.

A brief analysis of this article will show us what additional subjects may be brought in by way of collateral reading.

Virginia

In connection with the history of VIRGINIA, XXIV, 274, read the following articles or parts of articles:

Sir Walter Raleigh, XX, 274.

John Smith, XXII, 183.

History of Tobacco, XXIII, 451 (one column).

Introduction of Slavery into America, XXII, 146, beginning with "Spanish Colonies," second column, and ending at the bottom of page 147.

Northern Colonies

In connection with NEW ENGLAND, XXIII, 780, read about the Puritans, VIII, 305–11, 337–38; the Pilgrim Fathers, XXVIII, 427; and Roger Williams, XXIV, 618.

In connection with Pennsylvania, XXIII, 782, read about William Penn, XVIII, 502.

The Revolution

With the REVOLUTIONARY WAR, XXIII, 784, we reach the period of those great men whom we justly style "the fathers." Let us read the biographical sketches of a few of these makers of the nation:

George Washington, XXIV, 408.

Patrick Henry, XI, 602.

Thomas Jefferson, XIII, 624.

John Adams, I, 129.

James Madison, XV, 183.

James Monroe, XVI, 787.

Alexander Hamilton, XI, 368.

These articles will help us to understand not only the period of the Revolution, but the equally important periods which followed—the formation of the FEDERAL CONSTITUTION, XXIII, 786, and the beginnings of the government under the Constitution, XXIII, 786–87.

Nullification, XXIII, 800. With this read Andrew Jackson, XIII, 543, and John C. Calhoun, IV, 606.

Slavery

Opposition to Slavery, XXIII, 804. William Lloyd Garrison, X, 78. History of Slavery, XXII, beginning at the middle of first column, page 147 and continuing to the top of the first column, page 151. Henry Clay, V, 714; Daniel Webster, XXIV, 498; Stephen A. Douglas, VII, 326.

Entering now upon the period of the CIVIL WAR and the reconstruction which followed it, XXIII, 816–21, we may read, for additional information, the articles Abraham Lincoln, XIV, 665, U. S. Grant, XXVII, 142, Jefferson Davis, XXVI, 365, and Robert E. Lee, XIV, 400.

Read also the article on the Confederate States of America, XXVI, 251.

Supplementary Chapters

Before concluding this course of reading, it will be well to notice another very important article, or rather series of articles, relating to the history of our country. Among the articles comprising the American supplements to the *Britannica* there are forty-one pages of matter, XXIX, 357–99, which should be read, and some of it studied thoroughly. The facts there given are of interest and importance to every American citizen. Here are the headings of some of the sections:

The admission of the several States, XXIX, p. 357.

Representatives in Congress, p. 358.

Population, 12th Census (1900), p. 360.

Presidential elections, p. 361.

Center of Population, p. 362.
Recent History of the U. S., p. 369.
The Venezuelan Imbroglio, p. 378.
The War with Spain, p. 382.
The "Boxer" Rising in China, p. 397; also XXVI, 155.

II. ANCIENT HISTORY.

In indicating the following course of reading, an attempt will be made to cover all the more important periods of ancient history, and at the same time not to mark out more than can be mastered within a reasonable length of time. It is possible that the reader will enlarge it at many points by reading entire articles, of which only parts are here indicated; but, whether he does this or not, he should find himself at the end of the course possessed of a good general knowledge of ancient history, of its leading characters, and its more interesting scenes and incidents.

Oriental Countries

Egypt. A long and very scholarly article on this country is contained in the seventh volume of the *Britannica*. Read the following sections:

Description of Egypt, page 608; its ancient inhabitants, page 618; its chronology, page 631; the Egyptian dynasties, page 633; the twelfth dynasty, page 636; the accession of Ptolemy I, page 645.

Assyria and Babylonia. Read the entire article on these countries, III, 159. Read also the description of Babylon, III, 157, and of Nineveh, XVII, 525; also, the account of Jonah, XIII, 747, and that of Berosus, III, 524.

Phœnicia. Read the greater part of the article under this heading, and especially the following sections: Description of Phœnicia, XVIII, 815; origin of the Phœnicians, page 816; navigation, trades, and colonies, pages 818–20. Read also the articles Tyre, XXIII, 757, Sidon, XXII, 41, and Carthage, V, 140–43.

Persia. In volume XVIII of the *Britannica*, one hundred pages are devoted to Persia. The history of ancient Persia extends from page 573 to page 627. If your time is limited, begin with the section entitled Medo-Persian Empire, page 573; read the history of Cyrus, page 576, and of his successors, to the accession of Artaxerxes, page 585. The account of the expedition against Greece may be deferred until its proper place is reached in Greek history.

Greece

Greece. With the history of this country it is necessary to spend much more time. Begin by reading the whole of Section I, "Greek History to the Death of Alexander the Great," in volume XI, pages 81–95. For collateral reading, see the following articles: Troy, XXIII, 614–20; Lycurgus, XV, 96; Sparta, XXII, 383; Greek Games, X, 57. While studying the history of Attica, XI, 86, refer to the article Athens, III, 3, and read with particular care the description of that city given by Pausanias, III, 10. Solon's account of his own work, XI, 87, is supplemented by a much fuller account in the twenty-second volume of the *Britannica*, page 267. Here, too, it will be well to read the biography of Pisistratus, XIX, 139. The events which followed the historic battle of Marathon, XI, 89, brought prominently forward the great rival statesmen, Aristides, II, 445, and Themistocles, XXIII, 269. Then follows the period of Athenian supremacy, XI, 90; and in connection with it the article on Pericles, XVIII, 539, should be read.

With the Theban supremacy, read Epaminondas, VIII, 405; and, with the decay of Greek civic life XI, 93, study the excellent article on Demosthenes, VII, 59.

Turn now to the article Macedonian Empire, XV, 139, and read down to the account of the departure of Alexander on his great expedition against Persia. From this point continue the story with the article Alexander the Great, I, 425. The death of Alexander, as you will learn, was the signal for the breaking up of his empire. Ptolemy, one of his generals, established himself in Egypt, VII, 645; Seleucus, another general, founded a new Persian empire, with its capital at Seleucia, on the Tigris, XVIII, 598; and Antipater, who had been made regent of Macedonia, maintained the integrity of Greece, XV, 142. We need not follow the history of these fragments of Alexander's great empire — their wars with one another, and their internal dissensions. A new empire was about to arise which would overpower them all.

Roman History

Rome. The article under this heading, XX, 750–860, embraces a complete and very interesting survey of the history of the Eternal City from its foundation in legendary times to the year 1870. Read, as a beginning, the first sixteen pages of the article, to the section entitled "Rome and the Mediterranean States." Numerous collateral references present themselves, but if your time is limited they may be omitted, and the reading of the principal article may be continued. The story becomes very interesting now, and you need not be told to read it carefully. The second Punic War brings to our notice Hannibal, XI, 394, and the elder Scipio, XXI, 488. In connection with the third Punic War we shall read of the younger Scipio, XXI, 489, and of Cato the Censor, V, 208. Other collateral readings will include Marius, XV, 556; Sulla, XXII, 665; Cicero, V, 673; Catiline, V, 207; Pompey, XIX, 465; and Julius Cæsar, IV, 562.

These readings ought to give you a very complete knowledge of the history of Rome in the palmy and heroic days of the republic, as well as in the period of that republic's degeneracy.

The story of the Empire begins on page 787 of the twentieth volume; it ends with the downfall of the Western Empire (A. D. 476), as described on page 799. Let us, however, continue our reading with the Eastern Empire, until it, too, is ended with the fall of Constantinople, A. D. 1453. We shall find this part of the story in the article Greece, XI, 99–108. On the thread of these two articles the following biographies, each in its proper place, may be strung:

Augustus, III, 69; Tiberius, XXIII, 356; Nero, XVII, 357; Trajan, XXIII, 534; Hadrian, XI, 324; Marcus Aurelius, III, 75; Commodus, VI, 185; Constantine, VI, 266; Justinian I, XIII, 801.

For further collateral reading, add the following articles: Goths, X, 752; Alaric, I, 392; Vandals, XXIV, 64; Genseric, X, 143; Huns, XII, 396; Attila, III, 54.

Conclusion

This course of reading embraces in the aggregate about 150 pages of the *Britannica*. By reading an hour or so regularly every evening, one may complete it in a short time; and there is no doubt but that the reader will obtain from it a far more satisfactory view of ancient history than can be gained from any of the so-called "Universal Histories." The reason is obvious. Here the subject is presented as in a painting, with a distinct back-

ground, and the foreground appropriately filled with lifelike figures. It is no mere catalogue of events that you have been studying; it is history itself.

III. MODERN HISTORY.

The Mohammedan Empire. The first part of the article, MOHAMMEDANISM, XVI, 568, relates the story of Mohammed and the first four caliphs. Read this part carefully. Then proceed to the second part, XVI, 588, which gives an account of Moslem conquest and dominion down to the capture of Bagdad by Jenghis Khan, A. D. 1258. The most important event for us during this latter period is the conquest of Spain, a full account of which may be found in the article SPAIN, XXII, 326–30.

The Arab Conquest

Continental Europe from A. D. 476 *to* A. D. 1453. The period of ten centuries which intervened between the fall of the Western Empire and the capture of Constantinople by the Turks may be briefly studied. The Franks invade Gaul, IX, 466; the Goths and Lombards establish themselves in Italy, XIII, 478; the Visigoths gain control of Spain, XXII, 323; a new empire is established by CHARLEMAGNE, V, 349. This brings us to the year 814. From this point to the close of the period only a few events need be noticed. The rise of the feudal monarchy in France, IX, 473; the Hapsburg dynasty, X, 443, and III, 108; the house of Brandenburg in Germany, XX, 9. Now read the account of the Hundred Years' War between France and England, IX, 481–86. This prepares us for the study of the article on FEUDALISM, IX, 105, and the various notices of CHIVALRY indicated in the Index volume, page 194. See Dark Ages, XXVI, 355.

The Middle Ages

The chief events of this period are connected with the Crusades, which are the subject of an interesting and important article, VI, 549. In connection with the above-named articles there is room for a good deal of collateral reading. Study the following articles:

Venice, XXIV, 153; Florence, IX, 289; Medici, XV, 794; Naples, XVII, 194; Hanseatic League, XI, 401; and a part of the article on commerce, VI, 178–180.

From A. D. 1453 *to the French Revolution.* Among the important events of this period were the following:

The discovery of America, X, 159–71.

The invention of printing, XXIII, 730.

The circumnavigation of the globe; see Magellan, XV, 198.

The Reformation, XX, 332.

Modern Europe

The invention of the steam engine, XXII, 490.

The study of the history of this period may begin with the RENAISSANCE, XX, 392. In connection with this study, refer to the historical portion of each of the following articles:

Austria, III, 108–15; Prussia, XX, 5–15; Holland, XII, 72–86; France, IX, 487–525.

See also Italy, XIII, 492; Spain, XXII, 353.

The portions of this history which will claim our chief attention are: The career of CHARLES V, V, 358; the struggle of the Netherlands with Spain, XII, 77–80; The Thirty Years' War, III, 109. In connection with these, read: Wallenstein, XXIV, 349; Gustavus Adolphus, XI, 298; Louis XIV, IX, 503–14; Philip II of Spain, XVIII, 757; Catherine de Medici, V, 205; Peter the Great, XVIII, 712; Charles XII of Sweden, V, 364; Frederick the Great, IX, 646; and Catherine II of Russia, V, 203.

From the French Revolution to the Present Time. The leading article for the study of this period is that on FRANCE from page 525 to page 554, volume IX. Here you may read (1) of the Revolution, page 525; (2) of the Republic, page 532; (3) of the Empire, page 542; (4) of the subsequent history of France to the close of the presidency of M. Grévy. A supplementary article, XXVII, 19, brings the history of France down to date. In connection with the above, read the following biographical sketches: Mirabeau, XVI, 516; Marie Antoinette, XV, 547; Robespierre, XX, 617; Danton, VI, 718; Marat, XV, 533; Dreyfus Case, XXVI, 453–55.

The XIXth Century

The history of NAPOLEON fills thirty-seven pages of the *Britannica*, XVII, 199. In connection with this article, read the following: Josephine, XIII, 761; Talleyrand, XXIII, 35; Wellington, XXIV, 521.

These articles alone will give us the best part of the political history of Continental Europe down to the year 1815. The more important events which have since occurred outside of France may then be read:

The liberation of Greece, XI, 111.
The Crimean war, XXI, 110.
The Independence of Italy, XIII, 495.
The Austro-Prussian war, X, 452.
The Franco-Prussian war, X, 453.

And now you will no longer need the help of the GUIDE. Almost any information that you may desire can be found by turning to the proper heading in the *Britannica* as indicated in the Index volume.

For events that have occurred since 1879, as well as for the biographies of men who were living at that time, it is always well to consult the later volumes. For example, there is no separate article on Bismarck in the main portion of the *Britannica;* but in Volume XXV, page 485, there is a complete biographical sketch, and in the Index volume (page 122) there are references to other articles in which he is mentioned.

Here also are to be found articles relating to many other historical events of recent occurrence. See

Home Rule, XXVII, 309.

Corea and the war between China and Japan in 1895, XXVI, 284.

The British Dominions — England. In the article BRITANNIA, IV, 317, an account is given of the ancient Britons, and of the occupancy of their country by the Romans previous to its settlement by the English. The historical part of the article ENGLAND fills about one hundred pages (VIII, 238–328), which may be read at your odd moments of leisure. The history of England since 1874 is succinctly told in XXVII, 149.

Early Britain

From these articles alone you may obtain a good practical knowledge of English history. In connection with them, however, it will be profitable to read the following briefer articles:

William the Conqueror, XXIV, 606.
Henry II, XI, 586–87.
Thomas à Becket, I, 36–37.
Richard Cœur de Lion, XX, 554.
John, XIII, 724–25; and Charter, V, 374.
Stephen Langton, XIV, 287.
Edward I, VII, 592.
Henry VIII, XI, 590.
Queen Mary, XV, 599.
Lady Jane Grey, XI, 172.
Queen Elizabeth, VIII, 132.
Sir Francis Drake, VII, 337.
Charles I, V, 350.
Oliver Cromwell, VI, 528.
William III, XXIV, 610.

English Biography

Queen Anne, II, 55.
Marlborough, XV, 560.
Lord Chatham, V, 381.
Charles James Fox, IX, 436.
William Pitt, XIX, 143.

Read also ARMADA, II, 476, and ENGLISH COSTUMES, VI, 412.

Scotland. See article on SCOTLAND, XXI, 493–543. Read also for an account of specially important periods in Scottish history, the following biographical sketches:

Scottish History

William Wallace, XXIV, 348.
Robert Bruce, XX, 608.
Mary Queen of Scots, XV, 601.

Ireland. The historical part of the article IRELAND, XIII, 220–278, is extremely interesting. It includes such topics as the following: Legendary history of Ireland, page 248; Scotic conquest of Ulster, 251; early Irish church, 253; Ireland in the Early Middle Ages, 261; Anglo-Norman invasion, 264; Cromwell's campaign, 273; James II in Ireland, 274; struggle for independence, 276; Fenianism, 277.

Irish History

India. For a history of the English in India, see article INDIA, XII, 835–852. Read also the biographies of Robert Clive, VI, 9, and Warren Hastings, XI, 457.

Africa. For an account of the various possessions and dependencies in Africa, refer to the Index volume, and read what is said in the *Britannica* with reference to each of the several colonies or countries. Study particularly the article on the present condition of Africa, XXV, 59–83. Read also the special articles on

British Colonies

Natal, XVII, 245; XXVIII, 173.
Cape Colony, V, 37–45; XXVI, 51.
Livingstone, David, XIV, 726–29.
Rhodesia, XXVIII, 586; Cecil Rhodes, XXVIII, 585; Boer War, XXV, 516.
Jameson, L. S., XXVII, 438.
Stanley, Henry M., XXIX, 149.

Australia. For the history of the exploration and settlement of this continent, see AUSTRALIA, III, 89–93.

There still remain in the *Britannica* hundreds of historical and biographical articles which have not been mentioned in this chapter. But you can find them, if need be, without the help of a guide. Having been conducted thus far along the road, you will now have no difficulty in making your own way. With a little study and care you may even mark out another course of historical reading for yourself; for the *Britannica* contains the materials for many such courses.

Other Courses

CHAPTER VII

Five Courses of Reading in the History of Literature

COURSE THE FIRST — AMERICAN LITERATURE.

"O strange New World, that yet wast never young,
Whose youth from thee by gripin' want was wrung,
Brown foundlin' o' the woods, whose baby bed
Was prowled round by the Injun's cracklin' tread,
An' who grew'st strong thru' shifts an' wants an' pains,
Nursed by stern men with empires in their brains!"

Let us begin this study by a review of the history of our own literature, for it is in the institutions and productions of his own country that the pride and hope of every true American should be centred. "The number of writers who have acquired some amount of well-founded reputation in the United States is startling." In the course of study which we shall here offer, we can do little more than refer the student to the *Britannica's* numerous biographical sketches of American writers. The special article on American Literature, I, 630-44, written by the late Professor Nichol of Glasgow, is worthy of our careful attention; and the first two chapters of that article should be read by way of introduction to the course which we have before us. The first part of the third chapter (I, 632) will introduce us to colonial literature and the earliest American writers.

Colonial Writers

Captain John Smith, whose description of Virginia is usually spoken of as the first American book, is the subject of a long and interesting article, XXII, 183. But Smith's book can scarcely be called literature, certainly not in the better sense of the term. The first genuine literary work performed in America was George Sandys's translation of the works of Ovid, made on the banks of the James river, and published in 1626. See the article, George Sandys, XXI, 274; also Ovid, XVIII, 81. Of other early writers in America, there are a few whose biographies should be studied. Read the lives of the great theologians and controversialists of colonial New England:

Roger Williams, XXIV, 618.

John Cotton, XII, 764.

John Eliot, the Apostle of the Indians, VIII, 128.

Cotton Mather, XV, 637.

Jonathan Edwards, VII, 597.

Then turn to the article on Benjamin Franklin, IX, 626. This, with the first two columns of Chapter III, on page 632 of volume I, will complete our study of the Colonial Period.

Statesmen and Poets

Concerning the orators, statesmen, and poets who flourished during the Revolutionary Period there is much to read; and yet of the writings of that period there remains to us but little that is of permanent literary value. Read what is said on this subject on pages

632 and 633 of the first volume of the *Britannica*. Read the articles on

Patrick Henry, XI, 602.
Alexander Hamilton, XI, 368.
Thomas Jefferson, XIII, 624.
John Trumbull, XXIII, 629.
Joel Barlow, III, 325.
Benjamin Franklin, IX, 626–33.
Thomas Paine, XVIII, 140–41.

Coming now to the literature of the NINETEENTH CENTURY, let us read first of the great historians:

Historians

George Bancroft, XXV, 341.
John Bach McMaster, XXVII, 675.
William H. Prescott, XIX, 721.
John Lothrop Motley, XVII, 8.
Francis Parkman, XXVIII, 334.

Of the orators:

Orators

Daniel Webster, XXIV, 498.
Henry Clay, V, 714.
John C. Calhoun, IV, 606.
Edward Everett, VIII, 646.

Of writers of fiction and miscellanies:

Washington Irving, XIII, 383.

Novelists, etc.

Nathaniel P. Willis, XXIV, 619.
James Fenimore Cooper, VI, 299.
Charles Brockden Brown, IV, 345.
Nathaniel Hawthorne, XI, 479.
Harriet Beecher Stowe, XXIX, 169.
William Dean Howells, XXVII, 331.

Of essayists and theologians:

Essayists, etc.

William Ellery Channing, V, 341.
Theodore Parker, XVIII, 306.
Ralph Waldo Emerson, XXVI, 568.
Henry D. Thoreau, XXIII, 333.
Oliver Wendell Holmes, XXVII, 305.

Of poets:

Henry W. Longfellow, XIV, 870.
Edgar Allan Poe, XIX, 267.

Poets

William Cullen Bryant, XXV, 625.
James Russell Lowell, XXVII, 638.
John G. Whittier, XXIX, 545.
Walt Whitman, XXIX, 544.

Read, next, Chapter IV, pages 633–44, Volume I.

The new era in the history of American literature began at about the time of the Civil War. The products of that period, and the characteristics which distinguished them, are described in an able article by Prof. F. L. Pattee, in XXV, 164–71. See also American Drama, XXVI, 447.

If the student wishes to continue this course of reading so as to include a still more minute survey of our recent literature, with a study of the lives and works of some of the later writers, he can do so without further direction from the GUIDE.

Recent Literature

By consulting the Index volume he will be able in most cases to find any name of real prominence in American literature. A course of reading pursued in the manner here indicated cannot fail to impart a comprehensive knowledge of the history of our own literature. If conducted in connection with the reading of extracts from the writers mentioned, its educative value can scarcely be overrated. The readings may conclude with the "Summary," I, 644.

COURSE THE SECOND — ENGLISH LITERATURE.

See the special article on English literature, VIII, 360. This is a long and valuable contribution by

Eleven Periods

Thomas Arnold, and should be read in parts in connection with the following short articles, or parts of articles:

I. ANGLO-SAXON PERIOD, 596–1066.

The Venerable Beda, III, 415.
Cædmon, the first English poet, IV, 559.

King Alfred, I, 447; VIII, 361.
Ælfric, the Grammarian, I, 164.

II. ANGLO-NORMAN PERIOD, 1066–1215.

Romances and legends of King Arthur, V, 279; II, 568; VIII, 278; IX, 562; XX, 657–65.
Layamon (13th century), XIV, 374.
Geoffrey of Monmouth (12th century), X, 154.

III. THE TRANSITION PERIOD, 1215–1350.

Matthew of Paris (13th century), XV, 640.
Duns Scotus, VII, 470.
Roger Bacon (died 1292), III, 188.
Ormin's Rhythmic gospels, VIII, 354.
Robert Manning, XV, 501.

IV. EARLY ENGLISH LITERATURE, 1350–1477.

John Wyckliffe, XXIV, 744.
John Gower, XI, 20.
Geoffrey Chaucer, V, 389; VIII, 367.
John Lydgate, XV, 99.
The invention of printing, XI, 300; VIII, 368.
Caxton, the first English printer, V, 243; VIII, 356.

V. THE RENAISSANCE AND THE REFORMATION, 1477–1579.

John Skelton, XXII, 127.
John Colet, VI, 125.
Sir Thomas More, XVI, 842.
William Tyndale, XXIII, 717; VIII, 344–45.
Henry Howard, Earl of Surrey, XXII, 730; XXIV, 740.
Sir Thomas Sackville, Earl of Dorset, VII, 322.
Roger Ascham, II, 592.

VI. THE ELIZABETHAN ERA, 1579–1620.

Sir Philip Sidney, XXII, 40; XVIII, 351.
Edmund Spenser, XXII, 407.
Sir Francis Bacon, III, 173; VIII, 376.
Christopher Marlowe, XV, 563–65.
William Shakespeare, XXI, 773.
Ben Jonson, XIII, 751.
Beaumont and Fletcher, III, 405–10.
Philip Massinger, XV, 624–26.

VII. THE PURITAN PERIOD, 1620–1660.

Thomas Hobbes, XII, 33.
Sir Thomas Browne, IV, 350.
John Milton, XVI, 336; XIX, 279.
Jeremy Taylor, XXIII, 100.
Edmund Waller, XXIV, 350.
Abraham Cowley, VI, 472.

VIII. PERIOD OF THE RESTORATION, 1660–1700.

John Dryden, VII, 421.
Samuel Butler, IV, 523; XXI, 334.
John Bunyan, IV, 470.
John Locke, XIV, 758.

IX. IN THE AGE OF QUEEN ANNE, 1700–1727.

Daniel Defoe, VII, 24.
Jonathan Swift, XXII, 799; XXI, 335.
Joseph Addison, I. 134.
George Berkeley, III, 508.
Alexander Pope, XIX, 496.

X. THE GEORGIAN ERA, 1727–1800.

Samuel Richardson, XX, 558.
Bishop Butler, IV, 518; I, 695.
Henry Fielding, IX, 125; XXI, 335.
Samuel Johnson, XIII, 730.
David Hume, XII, 360.
Laurence Sterne, XXII, 569.
Thomas Gray, XI, 70.
Tobias G. Smollett, XXII, 193.
William Robertson, XX, 614.
Adam Smith, XXII, 179.
Sir William Blackstone, III, 695.
Oliver Goldsmith, X, 676.

Edmund Burke, IV, 481.
William Cowper, VI, 473.
Edward Gibbon, X, 512.
Jeremy Bentham, III, 496.
Richard Brinsley Sheridan, XXI, 833.
George Crabbe, VI, 478.
William Blake, III, 698.
Robert Burns, IV, 505.

XI. THE NINETEENTH CENTURY.

William Wordsworth, XXIV, 703; XIX, 283.
Sir Walter Scott, XXI, 570.
Samuel T. Coleridge, VI, 122.
Robert Southey, XXII, 303.
Charles Lamb, XIV, 235.
Henry Hallam, XI, 351.
Thomas Campbell, IV, 667.
Thomas De Quincey, VII, 89.
Lord Byron, IV, 537; XXI, 335.
Frederick Marryat, XV, 576.
Percy Bysshe Shelley, XXI, 826.
William Whewell, XXIV, 569.
George Grote, XI, 189.
Thomas Carlyle, XXVI, 64.
John Keats, XIV, 24.
Connop Thirlwall, XXIII, 326.
Sir Charles Lyell, XV, 102.
Thomas Hood, XII, 148.
George Finlay, IX, 192.
Thomas B. Macaulay, XV, 127.
John Henry Newman, XXVIII, 214.
Lord Lytton, XV, 122.
Elizabeth B. Browning, IV, 351.
John Stuart Mill, XVI, 320.
Charles Lever, XIV, 485.
Charles R. Darwin, XXVI, 358.
Alexander W. Kinglake, XXVII, 498.
Alfred Tennyson, XXIX, 251.
William M. Thackeray, XXIII, 232; XXI, 335.
Charles Dickens, VII, 150.
Robert Browning, XXV, 616.
Charles Reade, XX, 315.
Anthony Trollope, XXIII, 622.
Charlotte Brontë, IV, 328.
George Henry Lewes, XIV, 490.
James A. Froude, XXVII, 44.
John Ruskin, XXVIII, 631.
Charles Kingsley, XIV, 90.
George Eliot (Mrs. Mary Ann Cross), XXVI, 318.
Herbert Spencer, XXIX, 136.
John Tyndall, XXIX, 342.
Matthew Arnold, XXV, 250.
Edward A. Freeman, XXVII, 33.
Goldwin Smith, XXIX, 106.
William Wilkie Collins, XXVI, 231.
Thomas H. Huxley, XXVII, 346.
William Stubbs, XXIX, 186.
George Meredith, XXVIII, 73.
Samuel R. Gardiner, XXVII, 64.
Sir Edwin Arnold, XXV, 249.
Algernon C. Swinburne, XXIX, 210.
John R. Green, XXVII, 163.
William E. H. Lecky, XXVII, 564.
James Bryce, XXV, 625.
Thomas Hardy, XXVII, 230.
Rudyard Kipling, XXVII, 500.
Poet Laureate, XXVII, 554.
Read now the article on CANADIAN LITERATURE, XXVI, 38.

COURSE THE THIRD — ANCIENT LITERATURE.

1. *Greek Literature.* The article on Greek literature, XI, 121, is a comprehensive sketch of the literary development of Greece, showing how its successive periods were related to each other, and marking the dominant characteristics of each. It should be read in parts, in connection with the separate articles relating to the lives and particular works of Greek writers. The study of this literature naturally begins with the Homeric hymns and with the two great epics, the *Iliad* and the *Odyssey*. See the article Homer, XII, 111.

Greek Writers

After this read the following articles on three great poets of ancient Greece:

Hesiod, XI, 694.

Simonides, XXII, 90.

Pindar, XIX, 107.

This brings us to the GREEK DRAMA. Read the first two paragraphs on the Attic Literature, XI, 125; then turn to the article DRAMA, VII, 349, and read the six pages devoted to Greek drama. After this take up each of the great dramatists separately, the tragedians first:

The Drama

Æschylus, I, 188.

Sophocles, XXII, 284.

Euripides, VIII, 590.

Then re-read what is said of GREEK COMEDY, VII, 352, and study the article on the great comic dramatist, Aristophanes, II, 446.

PROSE WRITERS will next claim our attention, especially Æsop, the fabulist, I, 190; and the great historians, Herodotus, XI, 676; Xenophon, XXIV, 756; and Thucydides, XXIII, 343. After these make a short study of the Greek orators, XI, 127, and especially of Demosthenes, VII, 59, and Isocrates, XIII, 398.

Historians and Orators

The Greek philosophers will then come in for brief mention. Read the biographical portion of each of the following articles:

Philosophers

Socrates, XXII, 244.

Plato, XIX, 205.

Aristotle, II, 448.

Attention may now be given to the chapter entitled, THE LITERATURE OF THE DECADENCE, XI, 127, wherein is given a brief survey of the literary history of the Alexandrian and Græco-Roman periods of intellectual activity. Here a number of interesting names present themselves. In the department of pastoral poetry we shall read of Theocritus, XXIII, 272, and of his disciples and imitators, Bion, III, 602, and Moschus, XVI, 882. In the field of criticism we shall learn of Aristarchus, II, 443, whose studies, with those of his disciples, gradually formed the basis for the science of grammar. In mathematics we find the noted name of Euclid, VIII, 575. In prose fiction we have Lucian, XV, 44, the inventor of the art of the story-writer. In history we have Josephus, the historian of the Jewish nation, XIII, 761. In biography, Plutarch stands forth preëminent, XIX, 243. In geography appears the noted name of Strabo. In rhetoric we have Cassius Longinus, XIV, 875, the reputed author of the still famous essay on Sublimity. In philosophy are the great names of Epictetus, VIII, 418, and Marcus Aurelius, III, 75.

Later Writers

It would be easy to extend these readings in Greek literature almost indefinitely; and the student who wishes to do so may, by referring to the numerous articles devoted to the lives of famous Greek writers, continue them to almost any desired length.

2. *Roman Literature.* In the department of Roman literature we shall take as the basis for our studies the very comprehensive and scholarly article on that subject in XX, 735–46. This article, which gives a general survey of the progress of literature during the different periods of Roman history, should be read in sections, with constant reference to the separate articles devoted to the lives of the most famous Latin writers. In connection with the chapter on the first period (from 240 B. C. to about 80 B. C.), read the account of the ROMAN DRAMA,

First Period

VII, 354. Then study the history of the early Roman dramatists:

Nævius, XVII, 168.
Ennius, VIII, 398.
Plautus, XIX, 226.
Terence, XXIII, 203.

In connection with the chapter on the second period (80 B. C. to 42 B. C.), read the following special articles:

Second Period

Cicero, V, 673.
Sallust, XXI, 229.
Cæsar, IV, 562.
Lucretius, XV, 52.

Third Period

With the third period (42 B. C. to 17 A. D.) we enter upon the study of the Augustan age of Roman literature, III, 72–74. Here a noble list of names is presented, demanding a special study of the following biographical articles:

Virgil, XXIV, 267.
Ovid, XVIII, 81.
Horace, XII, 163.
Livy, XIV, 731.

Fourth Period

During the fourth period, extending for more than a century (17 A. D. to 130 A. D.), Roman literature continues to flow in the old channels, but there is a manifest deterioration in almost every department of literary effort. And yet among the dramatists we have Persius, XVIII, 674; among satirists, Juvenal, XIII, 813; among historians, Tacitus, XXIII, 24; among philosophers, Seneca, XXI, 690; among rhetoricians, Quintilian, XX, 193; and among poets, Martial, XV, 584, and Statius, XXII, 484. "The last writer who combines genius with something of national spirit is the poet Claudian (V, 712), who wrote his epics under the immediate inspiring influence of a great national crisis and a national hero." After him there is perhaps only one Latin writer whose life and works are deserving of study in this connection. That writer is Boetius (III, 743), who lived in the fifth century of our era, and who is described by Gibbon as "the last of the Romans whom Cato or Tully could have acknowledged for their countryman."

COURSE THE FOURTH — FIFTEEN GREAT LITERATURES.

1. *Hebrew.* XI, 533. The Bible, III, 548–54; Early Israelitish literature, XIII, 418; the Talmud, XXIII, 40; the Midrash, XVI, 297; the Mishnah, XVI, 526; Abenezra, I, 39.

2. *Sanskrit.* XXI, 286–300.

3. *Persian.* XVIII, 668. Zend-Avesta, XXIV, 814; Zoroaster, XXIV, 859; Firdousi, IX, 196; Omar Khayyam, XVII, 793; Hafiz, XI, 328.

4. *Greek.* XI, 121. Homer, XII, 111; Æschylus, I, 188; Xenophon, XXIV, 756; Plato, XIX, 205; Demosthenes, VII, 59.

5. *Roman.* XX, 735–46. Lucretius, XV, 52; Cæsar, IV, 562; Cicero, V, 673; Augustan Age, III, 72; Virgil, XXIV, 267; Ovid, XVIII, 81; Livy, XIV, 731; Tacitus, XXIII, 24.

6. *Chinese.* V, 567. Confucius, VI, 229; Lao-tsze, XIV, 295.

7. *French.* IX, 561. Froissart, IX, 797; Rabelais, XX, 200; Montaigne, XVI, 793; Corneille, VI, 370; Pascal, XVIII, 339; Molière, XVI, 646; La Fontaine, XIV, 204; Racine, XX, 210; Boileau, III, 750; Bossuet, IV, 62; Voltaire, XXIV, 305; Rousseau, XXI, 29; Victor Hugo, IX, 597, XXVII, 336; Cousin, VI, 462; Guizot, XI, 237; Dumas, VII, 450; George Sand, VII, 438; Émile Zola, XXIX, 632; the French Academy, XXV, 31.

8. *German.* X, 467. Luther, XV, 73; Arndt, II, 543; Wieland, XXIV, 589; Lessing, XIV, 478; Herder, XI, 650;

Goethe, X, 642; Schiller, XXI, 412; Novalis, XI, 422; Hegel, XI, 546; Heine, XI, 558; Paul Heyse, X, 487; Spielhagen, X, 487, XXIX, 140; Fritz Reuter, XX, 508; Auerbach, XXV, 294; Freytag, X, 487, XXVII, 40; Ebers, XXVI, 483.

9. *Italian.* XIII, 509. Dante, VI, 712; Petrarch, XVIII, 719; Boccaccio, III, 732; Tasso, XXIII, 82; Ariosto, II, 442; Alfieri, I, 443; Manzoni, XV, 522; Carducci, XXVI, 60.

10. *Spanish.* XXII, 367. Lope de Vega, XXIV, 132; Cervantes, V, 302; Calderon, IV, 585.

11. *Russian.* XXI, 111. Poushkin, XIX, 668; Turgenieff, XXIII, 519; Tolstoy, XXIX, 297; Gogol, X, 657; Dostoyevsky, XXVI, 440; Marie Bashkirtseff, XXV, 380.

12. *Swedish.* XXII, 791. Tegner, XXIII, 117; Fredrika Bremer, IV, 229; Runcberg, XXI, 66; Topelius, XXII, 796; Rydberg, XXVIII, 637.

13. *Norwegian.* XVII, 603. Björnstjerne Björnson, XXV, 488; Henrik Ibsen, XXVII, 352; Asbjörnsen, XXV, 266.

14. *Danish.* VII, 78. Oehlenschläger, XVII, 751; Hans Christian Andersen, XXV, 184.

15. *Arabic.* II, 230. The Koran, XVI, 619–628; Abu-Teman, I, 61; Tabari, XXIII, 5–9; Avicenna, III, 133; Al-Gazali, I, 450; Averroes, III, 129; Abulfeda, I, 60.

COURSE THE FIFTH — GENERAL VIEW OF THE SUBJECT (FOR ADVANCED STUDENTS).

Prose Literature. Let us begin our general study of prose literature by reading the article on History, XII, 21. Numerous collateral and additional references relating to the same subject will suggest themselves, and should be traced out and studied. Among these are the following: Influence of history upon the development of culture, II, 108; relation of history to evolution, VIII, 665; the philosophy of history, XVIII, 809; relation of history to archæology, II, 292, etc.

History

Following the reading of these, we may make a brief study of the distinctive features of the works of certain great historians. For example, read what is said of Herodotus, XI, 676; of Thucydides, XXIII, 343; of Livy, XIV, 731; of Sallust, XXI, 229; of Tacitus, XXIII, 24; of Villehardouin, XXIV, 246; of Froissart, IX, 700; of Bodin, III, 736–37; of Robertson, XX, 614; of Hallam, XI, 351; of Macaulay, XV, 127.

Fiction. Read the special article on Romance, XX, 648; also the article by Andrew Lang, entitled, Tales, XXIII, 32. Let this be followed by a study of the romantic literature of different countries. Observe what is said of French romance, XX, 676; of German, X, 484; of Spanish, XXII, 368; of Arabian, XXIII, 9; of Persian, XVIII, 670. As to romanticism in English literature, see XX, 880. The influence of romanticism upon French literature is described in IX, 597; and upon German literature, in X, 484.

Fiction

The Drama. Study the very comprehensive article on the Drama, VII, 343. Read about the drama in the time of Marlowe, XV, 563; and Shakespeare, XXI, 795; about the Greek drama, XI, 125; about the French drama, IX, 578; about the Spanish drama, XXII, 370; about the miracle-plays, V, 281. Read the special article on the Theatre, XXIII, 240.

Drama

Poetry. The scholarly article on Poetry, XIX, 269–85, is worthy of careful study. It would be well to read it by paragraphs, making reference in the meanwhile to additional articles on the lives and works of the great poets therein mentioned. Read

Poetry

Wordsworth's theory of poetry, XXIV, 705. See what is said of poetry as a fine art, IX, 180.

Satire. Read the article on Satire, XXI, 332. Study the lives and works of the great modern satirists: Rabelais, XX, 200; Voltaire, XXIV, 305; Dean Swift, XXII, 799; Thackeray, XXIII, 232, etc.

Satire.

SUPPLEMENTARY COURSE—BOOKS AND LIBRARIES.

This course may consist chiefly of a study of the two important articles on Books, XVIII, 149, and Libraries, XIV, 534.

The Advocates' Library, XXV, 53.

Astor Library, XXV, 278.

Boston Public Library, XXV, 551.

Libraries in Chicago, XXVI, 146.

See "Some Bookish Subjects" in the chapter entitled *The Bookman*, in this GUIDE.

For Libraries in the United States, see XIV, 534, and XXVII, 586. An interesting account of the Library of Congress is given in the article beginning on page 174 of Vol. XXVIII.

CHAPTER VIII

READINGS IN PHILOLOGY AND THE HISTORY OF LANGUAGE

"They have been at a great feast of languages."
—*Love's Labour Lost.*

PHILOLOGY is that branch of knowledge which deals with human speech, and with all that speech discloses as to the nature and history of man. In the following courses of reading it is proposed to give a general survey of the principal languages of the world, their history and the distinguishing characteristics of each. These courses may be considered as either prefatory or supplementary to the courses already indicated for readings in the history of literature. A fairly good knowledge of general history, such as may be acquired from the readings designated in Chapter VI of this volume, will add very much to your ability to appreciate and fully understand the courses which follow.

COURSE NO. I.

Begin with the article PHILOLOGY, XVIII, 778, and read carefully that part which relates to the science of language in general, pp. 778–91. This will give a general view of the subject, and prepare you for the more specific study of particular languages. The following articles, or parts of articles, may then be read:

Philology

Alphabet, I, 527–40.

Hieroglyphics, XI, 709–723.

Cuneiform Writing, VI, 624; and Inscriptions, XIII, 121–22.

History of language (article ANTHROPOLOGY), II, 94.

Theories of evolution with respect to language, VIII, 673.

Language and ethnology, VIII, 546.

Language and thought, XX, 80.

Language and mythology, XVII, 144.

ARYAN LANGUAGES, II, 609, and XVIII, 791 b. To this family of languages belong ten groups or sub-families, as follows:

1. *Sanskrit.* XXI, 282; XI, 753.

2. *Iranian.* XVIII, 139, 665.

3. *Armenian.* II, 482.

Aryan Languages

4. *Greek.* XI, 112. See also Greek literature; and learn about the Romaic dialects which originated in the Greek, XI, 121.

5. *Albanian.* XVIII, 798.

6. *Italic.* This group includes the Latin language, for a full history of which see XIV, 327. From the Latin have sprung the Romance languages, which are the subject of a valuable article in XX, 678. The great modern Romance languages are each treated in a separate article, as follows:

(1) Italian, XIII, 501; XIV, 341.
(2) Spanish, XXII, 360.
(3) Portuguese, XIX, 570.
(4) Provençal, XIX, 892.
(5) French, IX, 554.
(6) Ladino, XIII, 502.
(7) Roumanian, XXIV, 289.

7. *Celtic.* This group of languages is treated very briefly in XVIII, 798, and more fully in V, 258.

(1) The Gaelic language, which is a branch of the Celtic, is the subject of a separate article in X, 7. Other branches are treated as follows:

(2) Irish, or Goidelic, V, 258; with its dialect, the Manx, XV, 460 b; V, 259 a.

(3) Armoric, V, 281.
(4) Cornish (dialect), V, 258.
(5) Welsh, V, 258–59, 273.

8. *Germanic or Teutonic.* This great subfamily comprises two groups, known as the Eastern Germanic and Western Germanic languages. In the former group belong the Gothic language, X, 757, and the Scandinavian branch, XXI, 381. Of the Scandinavian languages there are two subdivisions: (1) the Eastern Scandinavian, which comprises,

Swedish, XXI, 386;
Danish, VII, 78, and XXI, 389;

and (2) the Western Scandinavian, which comprises,

Norwegian, XXI, 385;
Icelandic, XII, 663.

The Western Germanic languages are each treated in a separate article:

(1) English, VIII, 349.
(2) Frisian, IX, 692.
(3) German, X, 461.
(4) Dutch, XII, 87.

9. *Baltic.* This group embraces three unimportant groups, the first of which, Prussian, is now extinct (see XVIII, 798). The other two are the Lithuanian, XXII, 157, and the Lettish, briefly referred to in VII, 163, and XVIII, 798.

10. *Slavonic.* XXII, 156. Of this group there are two divisions, the Southern and the Western. The former includes the following languages:

(1) Russian, XXI, 111.
(2) Ruthenian, XIX, 320.
(3) Bulgarian, XXII, 158.
(4) Servian, XVIII, 555; XXII, 159.
(5) Slovenish, XXII, 159.

The latter or Western division includes,

(1) Bohemian, or Czech, XXII, 160.
(2) Polish, XVIII, 798; XXII, 160.

The GUIDE has presented above a brief outline for the study of the Aryan families of languages. The student who follows this course of reading carefully will have acquired no small knowledge of the science of philology, and he will be prepared, by way of review, to study the second part of the article on that subject, XVIII, 794–803.

COURSE NO. II.

A second course of study in philology will include the Semitic family of lan-

Semitic Languages

guages. To this family belong:

(1) The Hebrew language, XI, 531.

(2) The Phœnician, XXI, 673.
(3) The Assyrian, III, 166.
(4) The Syriac, II, 269.
(5) The Arabic, XI, 531.
(6) The Abyssinian, I, 64.
(7) Aramaic Languages, II, 269–70.

By way of supplementing this course, a short time may be spent in the study of Semitic Inscriptions, XIII, 122–24.

COURSE NO. III.

A third course of study in philology will include the history and peculiarities of the third great family of languages, the Hamitic (see XVIII, 791). Here we have:

(1) The Egyptian language, VII, 625.
(2) The Lybian languages, XVIII, 792.
(3) The Ethiopic languages, I, 235.

COURSE NO. IV.

A fourth course of study in philology will include the Ural-Altaic, or agglutinative, family of languages, XXIV, 5–7. To this family belong:

(1) The Finnish, IX, 190.
(2) The Hungarian, or Magyar, XII, 389.
(3) The Turkish, or Tatar, XXIII, 703–704.
(4) The Tungusian (including the Manchu), XXIII, 646.
(5) The Mongol (including possibly the Japanese and Korean languages), XVI, 776–78.
(6) The Samoyed, XXI, 263.

COURSE NO. V.

A fifth course of study in philology will include the monosyllabic, or South-eastern Asiatic family of languages. To this family belong:

(1) Chinese, V, 567–73.
(2) Burmese, IV, 495.
(3) Siamese, XXI, 895.
(4) Tibetan, XXIII, 368–69.

Many other languages and dialects receive notice in the *Britannica*. Not only students of philology, but many curious readers will be pleased to learn something about the language of the Basques, III, 366; of the Etruscans, VIII, 560–61; of the American aborigines, XII, 863 a′′′–864; I, 604–06; of the Peruvians(Quichua), I, 614 b; of the Gipsies, X, 547; of the Papuans, XVIII, 235; of the Hottentots, XII, 325; of the Kurds, XIV, 158; also something about the Dravidian or South-Indian family of languages, XII, 817; the Kolarian or Northeast-Indian group of languages, XII, 817; and the Malay-Polynesian family of languages, XV, 327–28. But we need enumerate no further. We have conducted the student to a point whence he will now be able to proceed in his researches without the help of a guide.

Miscellaneous Studies

Here are a few subjects of general interest, which it is well to know about:

Grammar, XI, 34.
Dictionaries, VII, 155.
Americanisms, XXV, 160.
Volapük, XXIX, 458.

Of General Interest

See now the references in the chapter on *The History of Literature* in this GUIDE; also those in the chapter entitled *The Writer*.

CHAPTER IX

Readings in Astronomy

"And let my lamp at midnight hour
Be seen in some high lonely tower,
Where I may oft outwatch the Bear
With thrice great Hermes; or unsphere
The Spirit of Plato, to unfold
What world or what vast regions hold
The immortal mind."

—*John Milton.*

Two Classes of Students

There are two classes of persons who will be helped by the courses of scientific reading proposed in this chapter and in those which follow: (1). The young man or young woman who is attempting to pursue some method of self-instruction at home, but is not yet prepared to grapple with the most difficult problems of science. (2). The student who is already well started on the way, and is anxious to extend and supplement the information which he has acquired from teachers and text-books, until he shall have gotten down to the very bottom of the subjects which he is studying. The first class will, as a general rule, be profited most by the shorter and more popular articles in the *Britannica;* the second will often find in the special and more technical articles just that kind of thoroughness and comprehensiveness which scholars admire and desire, and from which they alone are able to derive the greatest benefit. It is here that the superiority of the *Britannica* over every other work of reference is most apparent—it has articles adapted to the needs and comprehension of every class of readers.

The following readings in astronomy are intended for students who have attained to some proficiency in the science; but an effort has been made to meet the wants of the self-taught home student as well as those of the specialist and the scholar.

The home student should read the historical portion of the article on Astronomy, beginning on page 650 of volume II, and ending on page 667. He will find this chapter quite comprehensive, including nearly twenty pages of the *Britannica*, and giving an account of the progress of astronomical science from the earliest ages down to the present time. The college student will find the entire article on astronomy (72 pages in all), II, 650–721, to be more complete and satisfactory than most school text-books on the subject. The fact that it was written by the late Richard A. Proctor, one of the most famous of recent astronomers, is sufficient guarantee of its accuracy. The supplementary article, beginning on page 279 of Volume XXV, and written by Simon Newcomb, the leading American astronomer, contains an account of all the important

History of Astronomy

discoveries that have been made within the past twenty years.

Still pursuing the study of the history of this subject, read the entertaining article on ASTROLOGY, II, 646, and see what is said of astronomy in Arabia, II, 231. After that, read the biographies of the most famous astronomers, ancient and modern:

Astronomers

Thales, XXIII, 235.
Aristarchus, II, 444.
Hipparchus, XI, 760.
Ptolemy, XX, 92.
Copernicus, VI, 307.
Galileo, X, 28.
Tycho Brahe, IV, 181.
John Kepler, XIV, 47.
Jeremiah Horrocks, XII, 175.
Sir Isaac Newton, XVII, 449–60
John Flamsteed, IX, 253.
James Bradley, IV, 179.
Edmund Halley, XI, 354.
Laplace, XIV, 301.
The Herschels, XI, 683, 687.
François J. D. Arago, II, 263.
Urbain J. J. Leverrier, XIV, 486.
John Couch Adams, XXV, 44.
Richard A. Proctor, XXVIII, 495.
Camille Flammarion, XXVI, 659.
Samuel P. Langley, XXVII, 544.
Simon Newcomb, XXVIII, 204.

Having mastered the general outlines and the history of the subject, the student can next devote his time to the study of certain special departments of astronomical theory, described in the articles on GRAVITATION, XI, 59–68; ABERRATION, I, 50; and PARALLAX, XVIII, 250–59.

You are now prepared to enter upon the study of descriptive Astronomy. Begin with the SOLAR SYSTEM, and read what Professor Proctor says of the sun in II, 671; then turn to J. Norman Lockyer's admirable article on the same subject, XXII, 679. The nebular theory of the origin of the sun and planets will next claim your attention; and of this you will find, in XVII, 319, a full exposition and discussion by Sir R. S. Ball, the distinguished astronomer-royal for Ireland. The latest determinations of the distance of the sun are described in XXV, 281.

The Solar System

Before proceeding farther it will be interesting to notice some curious facts concerning the manner in which people of all ages and different nationalities have regarded the sun. Among other things, we shall learn how it was worshipped by the Sabæans, XXIV, 778; by the Phœnicians, XVIII, 815; by the Greeks, II, 162; and by the ancient Peruvians, I, 612.

Sun Worship

Read what is said of solar myths, XVII, 164, and XV, 787 a; also the myth of Phaethon, XVIII, 740; that of Adonis, I, 148; and that of Apollo, II, 162.

Festivals to the sun were held at Heliopolis, in Egypt, XIX, 100, VII, 667 a′′′; and also in Japan, XIX, 101; and one of the most famous temples in the world was that of the sun at Baalbec, III, 153.

Resuming the subject of descriptive astronomy, and the study of the solar system, read next of the PLANETS in their order:

Mercury, II, 679; Venus, II, 683, XIV, 586, XVIII, 250, and II, 658 and 696; the place of the Earth in the solar system, II, 669, and X, 191; Mars, XIV, 48, and II, 679, 696; the Asteroids, II, 643, 705, and XXV, 277; Jupiter, XVI, 260, and II, 683, 707; Uranus, II, 662, XI, 685, and II, 683; Neptune, XIV,

The Planets

486, and II, 684, 711. Olbers's theory of the origin of the asteroids is given in a brief biographical article on that great German astronomer, XVII, 774; and the most recent facts concerning those interesting bodies are stated in XXV, 277.

The article on the Moon, XVI, 825, next claims attention. The moon is also described in II, 676, 684. For its motion see XI, 67; for its phases, II, 697; for its influence on the tides, XXIII, 375–78, 389, 392; for its influence on atmospheric pressure, XVI, 129. The legends and myths of the moon are duly noticed in XI, 606, and XVII, 163.

The Moon

Many interesting things are told about Eclipses. For the nature and causes of eclipses, see II, 689 and 702; turn also to XIV, 585, and XXII, 684. Some historical facts with relation to the observation of these phenomena are interesting. The Chinese have very ancient records of such observations, see II, 651. The Assyrians also kept similar records, III, 165.

Eclipses

Read what is said about Comets, II, 712. The article on this subject, VI, 163, belongs to mathematical astronomy. Notice Kepler's theories, XIV, 49; Cassini's, V, 161. Leverrier's, XIV, 486; and Olbers's, XVII, 774. Recent observations on comets are described by Professor Simon Newcomb in XXV, 281. For Biela's comet, see VI, 172, and XVI, 116. An account of the appearance of twin comets may be found in XVI, 116.

Comets

In the article on Meteors, XVI, 112, there is much interesting information. Meteorites, or "falling stars," are noticed in XVI, 117, with the theories regarding their origin, etc. See also Aerolite, I, 167.

Passing now beyond the solar system, read first that portion of the article on astronomy which refers particularly to the fixed stars, II, 650, 721. For the classification of these stars, with reference to magnitude, turn to XVIII, 854. An interesting notice of new and variable stars is given in XXII, 685. For the measurements of the stars, see XVI, 260; and for their spectroscopic analysis, see X, 192, and XXII, 685.

The Fixed Stars

Among other subjects which are of interest to students of astronomy, we may mention the following:

The Zodiac, XXIV, 829.

The Zodiacal Light, XXIV, 835.

The Galaxy (Milky Way), II, 716.

Corona, VI, 380.

Celestial Photometry, XVIII, 854.

Astronomical Photography, XXVIII, 416–18.

If you would acquire a knowledge of astronomical instruments, read the valuable articles on the telescope, XXIII, 146, and XXIX, 245; also that on the transit circle, XXIII, 547; the notice of the micrometer, XVI, 250; of the sextant, XXI, 760; of the astrolabe, X, 162. There are two articles on Observatories which must not be omitted, XVII, 728–37, and XXVIII, 272. See the description of Pond's astronomical instruments, XIX, 467, and of Roemer's, XX, 635; also of the Orrery, XXVIII, 297.

Astronomical Instruments

Read of the famous American telescope-maker, Alvan Clark, XXVI, 183.

In connection with the study of Astronomy, we very naturally think of almanacs and calendars. The *Britannica* gives a good deal of information concerning both of these. The articles on the Almanac, I, 519, and

Almanacs

American Almanacs, XXV, 143, are especially interesting. So, too, is that on the Calendar, IV, 589. The different calendars that have been or are still in use are each fully described:

The Egyptian calendar, VII, 631.
The Hebrew calendar, IV, 601.
The Mohammedan calendar, IV, 602.
The Burmese calendar, IV, 495.
The Siamese calendar, XXI, 893.
The Gregorian calendar, IV, 595.
The famous Mexican calendar-stone, I, 610.

The peculiar terms used in almanacs and calendars are also explained, as:

Chronological eras or epochs, IV, 604; V, 617.
Epact, IV, 596.
Dominical letter, IV, 593, etc.

Time

The various methods of measuring time are described in XXIII, 418.

Difference between mean time and sidereal time, VI, 14.
Equation of time in astronomy, II, 675.
Timepieces, VI, 13; XXIV, 415.
Sun-dials, VII, 132.
Clocks, VI, 13, and XXVI, 203; Watches, XXIV, 415.
Standard time, XXIX, 148.

CHAPTER X

A General Course of Reading in Biology

"Full nature swarms with life."
— *Thomson, The Seasons.*

Biology in its widest sense is the science of life and living things. It therefore includes Zoölogy and Botany, to which separate chapters are devoted in this Guide. The following general course of reading, although far from exhaustive, includes several chapters on subjects relating to the foundation principles of the science. It is distinctively a course for advanced students.

Biology, III, 587.
Protoplasm, XIX, 850, 15, 24, 50.
Morphology, XVI, 863.

General Topics

Histology, XII, 6; III, 589; XVI, 867.
Differentiation, XVI, 85.
Taxonomy, II, 44; III, 591.
Classification, botanical, XVI, 871, XXVI, 188–90; zoölogical, II, 44.
Distribution, III, 591; of animals, VII, 232; of plants, VII, 248.
Geological distribution of animals, VII, 244.
Continuity of life, III, 592.
Physiology, III, 592.
Animal physiology, XIX, 13.
Human physiology, XVII, 686.
Vegetable physiology, XIX, 50.
Reproduction, XX, 419.
Gemmation, XXIII, 657.
Fission, III, 593.
Agamogenesis, XIII, 153.
Hereditary transmission, III, 594.
Heredity, I, 82; XXVII, 275.
Variation and Selection, XXIV, 83.
Individuality, III, 595.
Parasitism, XVIII, 262.
Ætiology, III, 595.

Abiogenesis, I, 51.
Biogenesis, III, 596.
Epigenesis, XI, 451.
Evolution
Embryology, XXVI, 559.
Species, XXII, 385.
Origin of Species, Darwin on, XXIV, 84, 89; Lamarck on, XIV, 231.
Evolution, VIII, 652.
Neo-Darwinism, XXVIII, 195.
Phylogeny, II, 44; III, 597.
See, also Haeckel, XX, 434; Darwin, XXVI, 358; Lamarck, XIV, 231; Huxley, XXVII, 346; Weismann, XXIX, 516; Neo-Lamarckism, XXVIII, 195.

THE VEGETABLE KINGDOM. See *Readings in Botany*, in this GUIDE.
Vegetable Kingdom
Limits and classification, III, 597.
Thallophyta, XX, 443; XXIV, 136.
Cormophyta, III, 600.

THE ANIMAL KINGDOM. See *Readings in Zoölogy*, Chapter XI, in this GUIDE.
Acclimatization, I, 80.
Animal Kingdom
Breeds and Breeding, IV, 219.
Hybridism, XII, 437.
Instinct, XIII, 164.
Animal Mechanics, XV, 783.
Longevity of Animals, XIV, 868.

CHAPTER XI

READINGS IN ZOÖLOGY

"I used to believe a great deal more in opportunities and less in application than I do now. Time and health are needed, but with these there are always opportunities. Rich people have a fancy for spending money very uselessly on their culture, because it seems to them more valuable when it has been costly; but the truth is, that by the blessing of good and cheap literature, intellectual light has become almost as accessible as daylight."—*Philip Gilbert Hamerton.*

THE amount and variety of information which the *Britannica* offers on all subjects connected with the natural sciences is truly wonderful. The articles on Zoölogy, or animal life, are very numerous—some of them brief descriptive paragraphs, instructive and interesting to every reader; others exhaustive treatises designed for the study of specialists. The vast range of such subjects can perhaps best be illustrated by reference to the following schemes for courses of reading in this science. The first two are of a popular character, and are believed to be not too difficult for the home student or amateur zoölogist; the third is more purely scientific, and will be appreciated only by those who have already made considerable progress in the study, and are able to understand its technical difficulties.

Three Courses

I. HISTORICAL COURSE.

In Volume XXIV, 838–842, the history of the science of zoölogy is treated in a manner which appeals to the interest of every person who cares to acquaint himself with the progress of scientific ideas. After reading this, the student will naturally turn to the biographical sketches of the

Progress of the Science

great men who have contributed most to our knowledge of this subject. The following articles will be especially interesting and instructive:

Biographies

Aristotle, the most famous of the ancient writers on this subject, II, 448.

Edward Wotton (1492–1555), the earliest English zoölogist, XXIV, 842.

William Harvey (1578–1658), the discoverer of the circulation of the blood, and the propounder of the theory of epigenesis, XI, 448.

Conrad Gesner, the eminent Swiss naturalist of the XVIth century, X, 495.

John Ray (1628–1705), "the father of modern zoölogy," XX, 313.

Carl Linnæus, "the Adam of zoölogical science," XIV, 677.

Comte de Buffon, the first great popularizer of natural history, IV, 397.

Gilbert White, author of "The Natural History of Selborne," XXIV, 580.

Baron Cuvier, the eminent French naturalist, VI, 653.

Charles Darwin, the great leader of evolutionary biology, XXVI, 358.

Ernst Haeckel, the famous German disciple of the doctrine of evolution, XX, 434.

Alfred Russel Wallace, author of "The Geographical Distribution of Animals," XXIX, 472.

Albrecht von Haller, the Swiss physiologist, XI, 354.

Johannes Müller, the German anatomist, XVII, 22.

Jean Baptiste Lamarck, a pre-Darwinian evolutionist, XIV, 231.

Louis L. R. Agassiz, the great Swiss-American naturalist, I, 245.

John Swammerdam, XXII, 768.

Anthony van Leeuwenhoek, XIV, 411.

René A. F. de Réaumur, XX, 321.

Charles Bonnet, IV, 31.

François Huber, XII, 341.

Asa Gray, the great American botanist, XXVII, 147.

Sir John Lubbock, XXVII, 640.

Thomas Henry Huxley, the English naturalist, XXVII, 346.

Ernst von Baer, founder of the science of embryology, XXIV, 846.

Sir Richard Owen, the foremost of the disciples of Cuvier, XXVIII, 306.

John Vaughan Thompson, the great authority on marine invertebrata, XXIV, 847.

Theodore Schwann, inventor of the cell theory, XXI, 481.

John James Audubon, the greatest of ornithologists, III, 62.

Alexander Wilson, the Scottish-American ornithologist, XXIV, 621.

Spencer F. Baird, secretary of the Smithsonian Institution, XXV, 328.

James Cossar Ewart, founder of marine laboratories, XXVI, 599.

G. Brown Goode, director of the National Museum, XXVII, 123.

Joseph Leidy, American biologist, XXVII, 573.

Lewis Le Conte, American naturalist, XXVII, 565.

II. POPULAR READINGS ABOUT ANIMALS.

As an introduction to these readings it will be interesting to notice the historical paragraphs in the article on Zoölogy, XXIV, 838–42. Read also the first section of the article on Mammalia, XV, 349, and the last section of the same article, XV, 451.

Mammalia

Many things in the article on Anthropology, II, 94–109, are both curious and instructive; but for the present the reader's attention is directed only to the section on the Origin of Man, page 97, and that on the Races of Mankind, page 98.

The article on the APE, II, 130–48, by Professor St. George Mivart, is a complete popular and scientific description of the various families and groups of monkeys. The general reader will be interested in the first section, pages 130–37, and also in the concluding sections, relating to the geographical distribution, etc., of apes.

The ELEPHANT is the subject of an important article, VIII, 116. His prehistoric relatives or progenitors are also appropriately described: the Mammoth, XV, 454; the Mastodon, XV, 628; and the Megatherium, XV, 837.

Perhaps the most interesting of all domestic animals is the CAMEL. See the general article, IV, 650, and also the section on the camel in Arabia, II, 211.

Interesting articles — historical and descriptive, and illustrated — are those on the Horse, XII, 176; the Dog, VII, 281; and the Cat, V, 178.

Carnivorous animals are represented by the Tiger, XXIII, 411; the Lion, XIV, 685; and the Hyena, XII, 436.

Some curious animals are: the Beaver, III, 410; the Chamois, V, 333; the Sloth, XXII, 171; the Ichneumon, XII, 665.

Birds

Of the long and very comprehensive article on BIRDS, III, 604, the general reader can select the following chapters as the most interesting: Fossil birds, III, 631; migration of birds, III, 662; birds' eggs, III, 669. The different classes of birds are variously represented and described in a large number of separate articles. For the present it is unnecessary to call attention to any of these articles further than to say that no popular course of reading should omit the Ostrich, XVIII, 65; the Rhea, XX, 519; the Eagle, VII, 509; the Raven, XX, 308; the Hummingbird, XII, 371; or the Albatross, I, 398. The Dodo, that wonderful bird which has but lately become extinct, is the subject of an interesting sketch, VII, 278.

Fishes

A general study of fishes, such as is contemplated in this course, should include a glance at the special article, XII, 666, and also a portion of the chapter on fish-culture, XIX, 135. The article on ANGLING, II, 30, will be read and enjoyed by every angler. Among the multitude of similar articles, the following on food fishes should not be omitted: Salmon, XXVIII, 654; Mackerel, XV, 160; Herring, XI, 683; Cod, VI, 95; Sardine, XXI, 322. Fossil fishes are noticed in I, 246, and poisonous fishes in XV, 792. See also

Spencer F. Baird, XXV, 328, and Seth Green, XXVII, 164, the famous fish-culturists.

David Starr Jordan, the American ichthyologist, XXVII, 462.

Aquarial Building, XXIX, 600; and Fisheries Building, XXIX, 599.

Reptiles

As to reptiles, read the following: General Characters of the Class *Reptilia*, XX, 454; the Division of *Reptilia* into Orders, XX, 454-57; Distribution of reptiles in time, XX, 478; Rattlesnake, XX, 305; Cobra, VI, 83; Asp, II, 624; Crocodile, VI, 524; Lizard, XIV, 738; Chameleon, V, 331; Tortoise, XXIII, 484.

Concerning CRUSTACEA there is a valuable article in VI, 558; but our popular course will include only the chapters relating to the Crab, VI, 477, and the Lobster, VI, 582.

Ocean Life

Ocean life is noticed in an interesting way in VII, 240–244. The articles on the Whale, XXIV, 551; the Walrus, XXIV, 357; the Dolphin, VII, 300; the Seal, XXI, 607; and

the Oyster, XXVIII, 309–10, are particularly interesting.

The above lists include only a very small portion of the articles on animals. These are sufficient, however, to indicate the great variety of interesting and practical information on zoölogical subjects contained in the pages of the *Britannica*.

This course of reading might be extended indefinitely until it would embrace many hundreds of subjects, and require half a lifetime for its completion. The purpose of the GUIDE, however, has been not to present an exhaustive course, but only to indicate that which may be completed easily by the amateur student within a comparatively brief period of time. A still briefer and much easier course is indicated in Chapter IV of this GUIDE.

III. SUPPLEMENTARY COURSE FOR SPECIAL STUDENTS.

The principal articles on zoölogical subjects, written by specialists and embodying the latest discoveries, are particularly valuable to advanced students. They are remarkable alike for their comprehensiveness and their accuracy. Taken together, they would form a complete library of zoölogy in themselves.

After reading the history of the science as it is related in XXIV, 838–842, together with the biographical sketches indicated in Course I above, the student will be prepared to make some study of the various forms of classification that have been proposed by great naturalists. Most of these may be found in the special article on ZOÖLOGY, already alluded to:

Classification

Aristotle's XXIV, 842.
The Linnæan, XXIV, 843.
Lamarck's XXIV, 845.
Cuvier's, XXIV, 845.
Owen's, XXIV, 846.
Huxley's, XXIV, 847.

A valuable scientific article on classification, written by Huxley himself, may be found in II, 44. Keeping Huxley's classification in mind, the student who cares to go so deeply into the subject may obtain a general and complete view of the science of zoölogy by studying the following articles in the order here given:

I. *Protozoa*, XIX, 852—a valuable article, very finely illustrated.

II. *Infusoria*, XXII, 113.

III. *Cœlenterata*, VI, 98—a short article, purely scientific. Under this sub-kingdom, see also Hydrozoa, XII, 580, and Actinozoa, I, 119.

IV. *Annuloida*. See Echinodermata, VII, 544.

V. *Annulosa*. Under this sub-kingdom there may be many references. We give only a few:

Crustacea, VI, 558.
Arachnida, II, 237.
Myriapoda, XVII, 122, and V, 295.
Insecta, XIII, 147 (see Index, 460).
Chætognatha (marine worms), XXI, 156, and II, 47.
Annelida, II, 58.

VI. *Molluscoida*, IV, 170. Under this sub-kingdom, see:

Polyzoa, XIX, 443.
Brachiopoda, IV, 170.
Tunicata, XXIII, 647; II, 48.

VII. *Mollusca*, XVI, 654; II, 48. Under this sub-kingdom, refer to the following subjects:

Lamellibranchiata, XVI, 710.
Gastropoda, XVI, 667.
Pteropoda, XVI, 689.
Cephalopoda, VI, 648.

VIII. *Vertebrata*, XXIV, 193. Under this sub-kingdom hundreds of references

might be given. The following articles and paragraphs will be found especially valuable:

Class 1. Pisces. See *Ichthyology*, XII, 666; distribution of marine fishes, VII, 243, XII, 715; freshwater fishes, XII, 708; fishes of America, I, 601; geographical distribution of fishes, XII, 707; fishes of prehistoric times, XII, 705; Agassiz's researches in fossil fishes, I, 245; angling, II, 30; aquariums, II, 189. Several special articles may be of interest to the general reader, such as:

Fishes

Sea fisheries, IX, 211.

Mackerel, XV, 160.

Cod, VI, 95.

Sturgeon, XXII, 643.

Fish-culture, XII, 703; XIX, 135; XXVI, 653.

Angling, II, 30.

Izaak Walton, XXIV, 362.

David Starr Jordan, XXVII, 462.

Class 2. Amphibia, I, 657.

Class 3. Reptilia, XX, 444; snakes, XXII, 199; crocodiles, VI, 524; alligators, I, 515; the tortoise (including the turtle and the terrapin), XXIII, 484.

Class 4. Aves. See Birds, III, 604; distribution of, III, 639, VII, 235; birds of America, I, 601. Turn to the special article, Ornithology, XVIII, 6. The history of this science, as narrated in the first pages of this article, is especially interesting. The list of leading works on birds, XVIII, 14–23, is very complete and valuable. The titles of hundreds of articles referring to different birds might be given, but we quote only a few; for example, in volume VI are such articles as the following: Cockatoo, p. 90; Condor, p. 225; Coot, p. 303; Cormorant, p. 361; Crane, p. 484; Crow, p. 545; Cuckoo, p. 605; Curassow, p. 626; Curlew, p. 628. But the student needs no guide to find such articles as these.

Birds

Class 5. Mammalia, XV, 349—a very comprehensive and scientific article, fully illustrated.

Classification of Mammalia, XV, 373.

History of Mammalia in former times, XV, 377. See also Palæontology, X, 282.

Mammalia

Subclass Echidna, VII, 543.

Subclass Metatheria, XV, 380; Marsupials, XIII, 848; Kangaroo, III, 97.

Subclass Eutheria, order Edentata, VII, 566; Sloth, XXII, 171; Armadillo, II, 477; Aard-vark, I, 10; Anteater, XV, 388, etc.

Order Sirenia, XV, 392; the Manatee, XV, 463, etc.

Order Cetacea, V, 310; Whale, XXIV, 551; Porpoise, XIX, 536; Dolphin, VII, 300, etc.

Order Insectivora, XV, 403.

Order Chiroptera, XV, 409; Bats, III, 372.

Order Rodentia, XV, 420; Squirrels, XXII, 454; Rabbits, XX, 199; Hares, XI, 425, etc.

Order Ungulata, XV, 427; Elephant, VIII, 116; Rhinoceros, XX, 535; Horse, XII, 176; Zebra, XXIV, 810; Deer, VII, 22, etc.

Order Carnivora, XV, 438; Cat, V, 178; Dog, VII, 281; Bear, III, 398; Lion, XIV, 685; Tiger, XXIII, 411; Puma, XX, 110; Jaguar, XIII, 551, etc.

Order Primates, II, 96; Lemur, XIV, 440; Monkey, II, 130; Man, XV, 451, and II, 94, etc.

MISCELLANEOUS READINGS.

The student who has followed this course of reading to the present point

will now be prepared to notice the following important special articles:

Special Articles

Anthropology, II, 91.
Animism, II, 49.
Biology, III, 587.
Evolution, VIII, 652.
Neo-Darwinism, XXVIII, 195.
Variation and selection, XXIV, 83.
Acclimatization, I, 80.
Reproduction, XX, 419.
Parthenogenesis, XXVIII, 340.
Embryology, VIII, 150. A valuable supplementary article, giving an account of the latest discoveries and theories in this department of science, may be found in XXVI, 559–68.
Breeds and Breeding, IV, 219.
Hybridism, XII, 437.
Distribution of Animals, VII, 232.
Longevity of Animals, XIV, 868.
Animal Physiology, XIX, 13.
Animal Heat, XXV, 195.
Animal Magnetism, XV, 279.
Animal Mechanics, XV, 783.
Sense-Organs, XXIX, 54.
Segmentation of the Vertebrate Head and Brain, XXIX, 46.
Instinct, XIII, 164.
Histology, XII, 6.

See *General Course of Reading in Biology*, Chapter X, for a more logical arrangement of these subjects.

CHAPTER XII

Readings in Botany.

"In my garden I spend my days; in my library I spend my nights.
My interests are divided between my geraniums and my books."
—*Alexander Smith.*

The reader who wishes to acquire a general knowledge of the subject of botany may begin by reading the chapter on the history of botanical science, IV, 70. After this, read the biographies of the famous men who have contributed most to the advancement of this science. Among these the following are named as among the most important:

Great Botanists

The elder Pliny, the first who made any extensive catalogue of plants, XIX, 235.

Andreas Cæsalpinus, the great Florentine botanist of the 16th century, IV, 562.

John Ray, the originator of the "natural system" of classification, XX, 313.

Joseph P. de Tournefort, the foremost French botanist of the 17th century, XXIII, 521.

Carl Linnæus, the real founder of the science, XIV, 677.

Jussieu, a famous French family of botanists, XIII, 797.

Robert Brown, the first British botanist to adopt and support the "natural system," IV, 347.

Augustin P. De Candolle, the Swiss botanist, who modified Jussieu's system of classification, VII, 17; IV, 71a–72b.

Sir William J. Hooker, XII, 156–57, and his son, Sir Joseph D. Hooker, XXVII, 317.

Stephen L. Endlicher, the Austrian botanist, XXVI, 574.

John Lindley, XIV, 669.

George Bentham, XXV, 429.

Asa Gray, the well-known American botanist, XXVII, 147.

John M. Coulter, author of many of the articles on botanical subjects in the Supplements to the *Britannica*, XXVI, 294.

After having read these biographical sketches, turn again to the special article on Botany, IV, 70–149, and notice the comprehensive manner in which the subject is there treated. This article comprises much more matter than is contained in the ordinary school textbooks, and, as you will see, is profusely and beautifully illustrated with numerous full-page plates.

If it is your wish to make a thorough study of the anatomical structure of plants, their arrangement and classification, their distribution over the globe, and the uses to which they are subservient, you will find this article to be full of just the kind of information that you want. We will suppose, however, that you prefer, instead of studying every portion of this article, to use it for purposes of reference, and in order to supplement the information which you obtain from other sources. If this be the case, consult the "Index of Principal Subjects," IV, 148. Even if you are making only a hasty and superficial survey of this delightful science, you will find several chapters in this article worthy of your attention. Here are a few which you cannot afford to pass unnoticed:

Article on Botany

Different parts of flowers, p. 113; essential organs of flowers, p. 121; respiration of plants, p. 107; pollen, p. 125; fertilization, p. 133; mosses, p. 96; lichens, p. 96; leaves, pp. 96–107; fruit, pp. 134–39.

One of the most important articles to aid in the systematic study of this science is that on Classification by Prof. John M. Coulter, XXVI, 188–90.

The article on Ecology, XXVI, 484, a new department of plant physiology, is indispensable to all advanced students.

The article on Morphology of Plants, XXVIII, 139, is equally lucid, scientific, and comprehensive.

Other articles relating to botanical topics are numerous. Any lover of flowers who does not care to pursue a course of reading may while away many pleasant hours in perusing chapters like the following:

Distribution of plants, VII, 248.

Propagation of plants, XII, 215, 240.

Reproduction of plants, XX, 435; XXVIII, 575.

Ancestry of plants, XXV, 182.

Fertilization by insects, XIII, 148.

Linnæus's classification of plants, XIV, 678.

Morphology, XVI, 863.

Alternation of generation, XXV, 149.

Assimilation in plants, XXV, 275.

Physiology of plants, XIX, 50.

Insectivorous plants, XIII, 140.

Parasitic plants, XVIII, 268.

The article on the Vegetable Kingdom, XXIV, 136–43, contains a complete classification of plants.

Read also:

Botanic Gardens, XXV, 553.

Algæ I, 448; XXV, 129.

Fungus, IX, 726.

Lichens, XIV, 555.

Hepaticæ, XIV, 724.

Muscineæ, XVII, 71.

In pursuing the study of botany in a practical way, it is of course necessary that you should acquire a knowledge

of plants at first hand, through personal observation. You must, therefore, make a collection of plants and arrange an herbarium for your own use and study. Full directions for doing this may be found in XI, 639.

The Herbarium

For further reference to plants, their culture, uses, etc., see the chapters in this volume entitled, *The Gardener*, *The Fruit-Grower*, and *The Woodsman*. In the first will be found a series of readings on the propagation and care of flowers and vegetables; and in the others some interesting and curious matter pertaining to trees, their modes of growth, their history, and their uses in the world's economy. It is well to remember that all the most important trees and plants in existence are the subjects of special articles in the *Britannica*. These may readily be found in their proper alphabetical place or by consulting the Index volume.

Further Studies

CHAPTER XIII

Readings in Geography

What a world is this!"—*As You Like It.*

I. HISTORY OF GEOGRAPHY.

No teacher of geography can afford to be without the *Encyclopædia Britannica*. In its pages are found a wealth and variety of matter pertaining to this science which it is impossible to find in any similar work. By reference to its numerous geographical articles all difficult questions may be easily solved, and a store of information may be acquired which will be of infinite value at times when it is needed most.

The teaching of geography began in very ancient times. The people of antiquity knew but very little about the earth, it is true; but they were anxious to perpetuate and extend that knowledge. Among the Greeks it was customary to lay particular stress upon the teaching of the second book of the Iliad, for that book contains, in connection with the "catalogue of ships," a brief notice of the geography of the countries known at the time of the Trojan war. (See Homer, XII, 111; Iliad, XI, 122; Troy, XX, 653.) Among ancient travellers and explorers the following are specially worthy of note:

History of Geography

Hanno, the Carthaginian, who is believed to have reached the Sargasso Sea, in the mid-Atlantic, and who wrote the *Periplus*, probably the earliest known geographical work, XI, 398 b.

Herodotus, who travelled in Scythia, Persia, Syria, Asia Minor, and Egypt, XI, 676.

Pytheas, from whom we derive our earliest knowledge of Britain, XX, 149.

Nearchus, the famous admiral of Alexander the Great's fleet, XVII, 314, whose voyage synchronized with that of Pytheas (about 330 B. C.).

The first person who attempted to reduce geography to a science was

Eratosthenes (VIII, 459); and when we consider how limited was his knowledge of the subject we are surprised that he succeeded so well. He was followed by Hipparchus (XV, 523), who proposed a method for determining the relative position of places upon the earth; and by Pliny the Elder (XIX, 235), who gave a geographical account of the known world. Later came Ptolemy, the greatest of all the ancient geographers (XX, 92). His maps are the most ancient that have come down to us. (For a copy of his map of the world, see XV, 524.) Strabo, who was a century or two earlier, was perhaps even more scientific in his methods and conclusions than Ptolemy (XXII, 609).

The Middle Ages

During the Middle Ages, geography was taught in the monastic schools. (See *trivium* and *quadrivium*, XX, 529 b.''') In the course of study it was placed under the head of geometry; but the "geometry" of these schools consisted chiefly of an abridgment of Ptolemy's or Pliny's geography (X, 158; XIX, 235), to which the definitions of a few geometric forms had been added. For a thousand years absolutely no advance was made in either the knowledge of geography or the methods of teaching it.

Birth of Modern Geography

The first modern impetus to discovery was given by the invention of the mariner's compass (VI, 200), which was followed by a corresponding extension of geographical knowledge. Then came the invention of the astrolabe (XVII, 258). Then Prince Henry the Navigator began his career of exploration (XI, 599); Columbus gave a new impetus to the study of geography by discovering a new continent (VI, 153); and Magellan's expedition gave another impetus to it by circumnavigating the globe. Other bold adventurers sailed the seas and added their contributions to mankind's stock of knowledge concerning the world and its inhabitants. See Hakluyt, XI, 338, and Purchas, XX, 120.

But the history of the progress of geographical study is given in full, and with many interesting details, in the *Britannica*. See Geography, X, 157.

In obtaining a knowledge of the history of this subject, the following articles will be found full of information:

Globe, X, 606.

Maps, XV, 522; earliest forms of maps, XX, 96, 100; classes of maps, X, 171; Mercator's map, XVII, 260.

Promoters of Geographical Knowledge

Navigation, XVII, 257.
Marco Polo, XIX, 417.
Varenius, XXIV, 76.
Rennell, XX, 409.
Ritter, XX, 585.
Petermann, XXVIII, 394–95.

See also Polar Explorations since 1880, XXVIII, 448.

Henry M. Stanley, XXIX, 149.

II. A VIEW OF THE WORLD.

On the orthography of geographic names, see XXVII, 77.

The World as a Whole

Every reader of the *Britannica* will of course understand that all articles descriptive of the continents, and indeed of every place of importance in the world, are to be found in their appropriate places in the different volumes of this work. Hence it is not necessary to encumber the pages of the GUIDE with mere lists of such articles. The titles of some of these articles may by grouped together, however, according to topics, in such a way as to indicate a number of brief courses of reading on geograph-

ical subjects. Begin, for example, with the world as a whole. Read the article on Physical Geography, X, 188; then take up the following in their order:

The Globe, X, 606–11; the Relief Globe, XXVII, 109.

Maps, XV, 522–30.

The Ocean, X, 189, 197, 250.

Atlantic Ocean, III, 15.

Pacific Ocean, XVIII, 118.

Indian Ocean, XII, 860.

Ocean Currents, III, 15, X, 250.

Currents of the Pacific Ocean, XVIII, 121.

Currents of the Indian Ocean, XII, 861.

The Continents: Europe, VIII, 597; Asia, II, 596; Africa, I, 219; Australia, III, 89; America, I, 587.

Land

Seas, XXI, 605 (see Index volume, page 810); Mediterranean Sea, XV, 828; Red Sea, XX, 328; Aral Sea, II, 268; Black Sea, III, 690;

Water

Caspian, V, 153; Baltic, III, 253; North, XVII, 576; Caribbean, V, 91, etc.

Lakes (special article), XIV, 217.

Rivers, XX, 586; The Amazon, I, 575, 592; Mississippi, XVI, 541; Yukon, I, 393, XXV, 115, 116; Nile, XVII, 517, VII, 611; Niger, XVII, 510; Congo, XXIV, 801; Indus, XII, 888; Euphrates, VIII, 586; Ganges, X, 62; Rhine, XX, 533; Danube, VI, 721.

Cataracts and Waterfalls, XXVI, 85.

Mountains, XVII, 10; Alps, I, 544; Atlas, III, 25; Apennines, II, 149; Appalachian, II, 175; Andes, II, 15; Rocky, XXIII, 846; Himalaya, XI, 733; Ural, XXIV, 7; Pyrenees, XX, 132.

III. MAPS IN THE BRITANNICA.

To the student of geography, one of the most instructive articles in the *Britannica* is that on the making of maps, XV, 522. The account therein given of the first essays in map-making is particularly interesting. This is followed by chapters on the development of map-making among the Greeks, XV, 523; on map-making among the Romans, page 524; on map-making in the Middle Ages, page 524; on nautical maps, page 525; on the maps of Ptolemy and his successors, page 527; on the period of triangulations and geodetic surveys, page 529. In connection with this article, the curious reader will find a double-page colored illustration comparing Ptolemy's map of the world with the actual positions and distances, thus showing that, however inaccurate it may have been in details, it was nevertheless constructed according to strictly scientific methods, and in that respect was perfectly correct.

Historical

An outline of Mercator's map of the world, drawn in 1569, is another interesting feature of this article, XV, 528. The Borgia map, X, 161, made in the 15th century, just before the discovery of the Western Hemisphere, is not only a great curiosity, but worthy of study, as illustrating the ideas of learned men in the Middle Ages concerning the shape and extent of the earth. The Lenox Globe, represented in X, 607, and supposed to have been constructed in 1506–07, illustrates the next step in the advancement of geographical knowledge.

The maps in the *Encyclopædia Britannica*, if collected in a single volume, would form one of the most complete and convenient atlases ever published. But since these maps are necessarily somewhat widely scattered through the various volumes of the *Encyclopædia*, few people realize the extent and importance of this feature. In fact, there is no country on the globe that is not accurately represented in these pages.

COLORED MAPS.

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Kentucky and Tennessee — county map, XIV, 43.
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Lancashire, England, XIV, 252.
Leicester and Rutland, England, XIV, 424.
Lincoln, England, XIV, 659.
London, XIV, 827.
Central London, XIV, 827.
Louisiana — parish map, XV, 21.
Lycaonia, Lycia, Lydia, XV, 93.
Macedonia, XV, 137.
Madagascar, XV, 168.
Madeira, XV, 137.
Maine — county map, XV, 299.
The Malay Peninsula, XV, 323.
Maltese Islands, XV, 137.
Ptolemy's Map of the World, XV, 524.
Maryland and Delaware — county map, XV, 609.
Massachusetts and Rhode Island — county map, XV, 617.
Mesopotamia, XVI, 568.
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Michigan — county map, XVI, 246.
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Mississippi — county map, XVI, 544.
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The Mohammedan Empire, XVI, 568.
Monmouth, England, XVI, 780.
Montana — county map, XVI, 798.
Morocco, XVI, 856.
Nebraska — county map, XVII, 315.
Nevada — county map, XVII, 376.
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New Hampshire — county map, XVII, 400.
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New Mexico — county map, XVII, 409.
New South Wales — county map, XVII, 418.
New York — county map, XVII, 462.
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New York City on larger scale (two sheets), XVII, 469.
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Norfolk, England, XVII, 549.
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Oregon — county map, XVII, 845.
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Pacific Ocean, showing currents and routes of travel, XVIII, 122.
Palestine, XVIII, 174.
Paris and its Environs, XVIII, 278.
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Modern Persia, XVIII, 626.
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Philadelphia (two sheets), XVIII, 750.
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Scotland in the 16th century, XXI, 520.
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Worcestershire, England, XXIV, 700.
Wyoming — county map, XXIV, 748.
Yorkshire, England, XXIV, 783.

PLAIN MAPS.

These are so numerous that we shall name only a few of the most important:
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Sketch map of Belgium, III, 444.
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Plan of Bristol, IV, 315.
Map of Burmah, IV, 492.
Plan of Calcutta, IV, 582.
Maps of great canals, IV, 700, 701, XXVI, 44.
Map of Ceylon, V, 312.
Plan of Chicago, V, 530.
Plan of Cincinnati, V, 684.
Map of Constantinople, VI, 272.

Plan of Copenhagen, VI, 305.
Sketch-map of Corea, VI, 347.
Map of Cornwall, England (double page), VI, 376.
Map of Cumberland, England (double page), VI, 615.
Plan of Edinburgh, VII, 573.
Map of Mount Ætna and Vicinity, VIII, 550.
Plan of Geneva, X, 132.
Plan of Glasgow, X, 569.
Map of Guiana, XI, 221.
Plan of Halifax, XI,343 .
Plan of Hamburg, XI, 362.
Plan of Jersey City, XIII, 646.
Plan of Lisbon, XIV, 697.
Plan of Liverpool, XIV, 719.
Norden's map of Tudor London, XIV, 857.
Map of Long Island, XIV, 876.
Plan of Louisville, Ky., XV, 25.
Plan of Madras, XV, 189.
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The Maldive Islands, XV, 331.
Plan of Manchester, XV, 467.
Mercator's *Nova et Aucta Orbis Descriptio*, 1569, XV, 524.
Plan of Marseilles, XV, 579.
Map of Mauritius, XV, 646.
Plan of Melbourne, XV, 845.
Plan of Milan, XVI, 303.
Map of Montenegro, XVI, 806.
Plan of Montreal, XVI, 820.
Plan of Moscow, XVI, 884.
Plan of Naples, XVII, 195.
Map of Natal, XVII, 246.
Plan of New Orleans, XVII, 413.
New York in 1695 and 1728, XVII, 470.
Plan of Olympia (Greece), XVII, 789.
Plan of Pittsburg, XIX, 160.
Plan of Pompeii, XIX, 461.
Map of the Punjab, XX, 113.
Plan of the Forum Romanum, XX, 833.
Plan of the Palatine Hill, Rome, XX, 842.
St. Petersburg, XXI, 201.
Geological map of Texas, XXIII, 220.
Cotidal lines of the world, XXIII, 397.
Turkestan, XXIII, 672.
Map of Venice, XXIV, 170.
Plan of Verona, XXIV, 185.
Plan of Washington, D. C., XXIV, 404.

IV. MISCELLANEOUS GEOGRAPHICAL SUBJECTS.

Some interesting and curious selections worth reading in connection with the study of geography:

Interesting Topics

Geographic names, XXVII, 77.
The Sahara Desert, XXI, 157; latest discoveries in, XXV, 60.
Dead Sea, VII, 3.
Sargasso, Sea, III, 19, 24.
Mount Vesuvius, XXIV, 212.
Volcanoes, X, 214.
Earthquakes, VII, 526.
Mammoth Cave, XV, 455.
Niagara Falls, XVII, 486; Yosemite Falls, IV, 619.
The Black Forest, XXIV, 735.
Gibraltar, British fortress in Spain, X, 520.
Polar Regions, XIX, 327–43, and XXVIII, 448. These two articles give a complete history of arctic exploration and adventure from the earliest times to the present.
Recent explorations in Africa, XXV, 59.

Famous Cities

Famous Cities and Towns; Aix-la-Chapelle, I, 383; Alexandria, I, 436–38; Athens, III, 3; Baden-Baden, III, 195; Bagdad, III, 199; Benares, III, 478; Berlin, III, 512; Boston, IV, 64; Bristol, IV, 314; Brooklyn, IV, 334; Brussels, IV, 363; Cabul, IV, 553; Cairo, IV, 572; Calcutta, IV, 582; Cambridge, IV, 644; Chicago, V, 530; Edinburgh, VII, 569; Havana, XI, 467; London, XIV, 827 (see Index volume, page 538); Madrid, XV, 190; New Orleans, XVII,

412; New York, XVII, 469 (see Index volume, page 634); Paris, XVIII, 278 (see Index volume, page 674); Rome, XX, 824 (see Index volume, page, 774); St. Petersburg, XXI, 199; Venice, XXIV, 153 (see Index volume, page 944); Vienna, XXIV, 237; Versailles, XXIV, 190; Jerusalem, XIII, 646; Babylon, III, 157; Nineveh, XVII, 525; Nippur, XXVIII, 247; Persepolis, XVIII, 569; Ispahan, XIII, 404; Palmyra, XVIII, 202; Damascus, VI, 696; Antioch, II, 115; Troy, XXIII, 614; Tyre, XXIII, 757; Constantinople, VI, 269; Mecca, XV, 676; Medina, XV, 826; Cordova, VI, 345.

V. THE UNITED STATES.

See the special article, XXIII, 777–886, and the index on the last page. See also the historical and statistical view of the United States, XXIX, 357.

Our Country

Both of these long articles are interesting and comprehensive, presenting a complete exposition of the geographical features of the country, together with an account of its history, industries, and natural resources.

Each of the States and Territories is treated in a similar manner, both in the body of the *Britannica* and also in the Supplements. For example, for Arizona, see II, 472, and XXV, 235; Arkansas, II, 473, and XXV, 238. All these may be easily found without any further help from the GUIDE.

CHAPTER XIV

A BRIEF COURSE OF READING IN METEOROLOGY

> "When it is evening, ye say, It will be fair weather: for the sky is red. And in the morning, It will be foul weather to-day: for the sky is red and lowring."—*St. Matthew.*

METEOROLOGY, in its later and more strictly definite signification, is the scientific study of weather and climate, their causes, changes, relations, and effects. In the *Encyclopædia Britannica* there is a comprehensive treatise upon this science written by Professors A. Buchan, of Edinburgh, and Balfour Stewart, of the Royal Society of London. It embraces seventy double-column pages, equal in matter to a duodecimo volume of more than 350 pages, and is fully illustrated. (See XVI, 119–92.) The supplementary article (XXVIII, 77) is equally valuable and comprehensive.

General Treatise

A short and instructive course of reading in meteorology would include, besides the main points in these leading articles, the following references:

Air, I, 379.

Atmosphere, III, 26.

Ozone, XVIII, 116.

Temperature, XI, 495. (See general index.)

Thermometer, XXIII, 308.

Climate, VI, 3.

Principal causes which determine climate, VI, 4.

Effect of vegetation on climate, VI, 5.

Temperature of the sea, XVI, 121, 137.

Inflence of the Gulf Stream upon climate, III, 19.

Influence of the Kuro Siwo, or Japan current, XVIII, 122.

Hygienic value of Ocean climate, VI, 6.

Temperature

Distribution of temperature, XVI, 139.

Humidity of the air, XVI, 123; III, 30.

Dew, XVI, 125.

Barometer, III, 329.

Atmospheric pressure, III, 26; XVI, 144.

Isobars, XVI, 146.

Diurnal oscillations of the barometer, XVI, 125.

Influence of the moon upon atmospheric pressure, XVI, 129.

Winds, XVI, 148.

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Relation of winds to climate, VI, 7.

Variation in the direction of winds, XVI, 130.

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Monsoons, II, 603.

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Cyclones, III, 31; XVI, 160.

Whirlwinds and waterspouts, XVI, 134.

Tornadoes, XXIII, 858.

Typhoons, II, 603; XVI, 160; XXIII, 718.

Blizzards, XXV, 506.

Hurricanes, XVI, 160.

Prevailing winds, XVI, 148.

Aqueous vapor, XVI, 143.

Clouds, XVI, 131.

Rainfall, XVI, 132, 155; influence upon climate, VI, 7; rain-gauge, XX, 268; connexion of sun-spots with rainfall, IX, 25.

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Thunderstorms, XVI, 133.

Hailstorms, XVI, 136.

Snowstorms, XVI, 159.

Hygrometry, XII, 603.

Weather and weather maps, XVI, 162.

Weather forecasts, XVI, 163.

American Weather Bureau, XXVIII, 77.

The Weather Bureau

Increase Allen Lapham, founder of the weather bureau, XXVII, 547.

Flags used by the weather bureau, XXIX, 88.

Terrestrial Magnetism, XVI, 164.

The magnetometer, XV, 239.

The declinometer, XVI, 164.

Terrestrial Magnetism

The dip circle, XVI, 165.

Magnetic poles of the earth, XVI, 168.

Influence of the sun upon terrestrial magnetism, XVI, 171, 175, 182, 186, 187, 188.

Optical Meteorology (see Optics).

Aurora borealis and australis, III, 79; II, 688; influence of sun-spots on, III, 85.

CHAPTER XV

Readings in Mathematics

"He apprehends a world of figures here." — *Henry IV.*

"Inquire about everything that you do not know; since, for the small trouble of asking, you will be guided in the road of knowledge.— *From the Persian.*

In the *Britannica*, each of the great branches of mathematical science is treated under its own head and at considerable length; and yet it is not presumed that any person will attempt to acquire the mastery of arithmetic, or algebra, or geometry from these articles. Here, if anywhere, the guidance of the living teacher and the assistance of specially prepared text-books are absolutely essential. The mathematical treatises in the *Britannica*, therefore, are valuable chiefly for occasional reference; they are not intended for general study, and certainly not for popular reading. Students and teachers, however, will frequently be able to derive valuable assistance from them in the solution of knotty problems or the elucidation of difficult propositions. It is well, therefore, to remember where they can be found.

For Reference Only

History of Mathematics.

The history of mathematics is a subject in which every student, whether he be a mathematician or not, must feel no little interest; and it is to a knowledge of this subject rather than to the abstruse study of any particular branch of the science that the present course of reading points. It is supposed that the reader has already some general acquaintance with the elementary principles of mathematics, derived, as is ordinarily the case, from the text-books used at school. These readings from the *Britannica* will supplement his present knowledge, and perhaps encourage him to advance farther in his acquisitions.

Ancient Mathematics

The best introduction to this course is the short article on Mathematics, XV, 635. Read especially the historical parts, and omit, until a future time, such sections and paragraphs as seem too technical or too difficult for ready comprehension.

Notice what is said of Pythagorean mathematics, XX, 146, and of Hindu mathematics, XXI, 309.

Now read the historical portion of the article on Arithmetic, II, 460–62. The paragraphs relating to the different methods of notation are specially interesting, and may be read in connection with the article on Numerals, XVII, 639. The biographies of the following distinguished arithmeticians should be read next:

Archimedes, the greatest mathematician of ancient times, II, 332.

Great Mathematicians

Apollonius of Perga, who flourished a little later than Archimedes, II, 163.

Diophantus, a Greek writer on arith-

metic and algebra, 4th century, I, 451.

Maximus Planudes (died 1350), referred to in XVII, 641.

Robert Recorde (1558), author of an algebra entitled *The Whetstone of Witte*, and of one of the first arithmetics published in English, XX, 323.

Next turn to the history of algebra, I, 451–56. Notice the list of writers on algebra, page 457. Read the following biographies of distinguished algebraists:

Leonardus Pisanus (Leonardo of Pisa), XIX, 134–35.

Girolamo Cardan (16th century), author of the second printed book on algebra, V, 80.

Algebra

François Vieta, "the father of modern algebra," XXIV, 241.

Thomas Harriott, XI, 440; I, 454.

René Descartes, VII, 101.

Bonaventura Cavalieri, XIII, 7; XX, 617 a.'

Pierre de Fermat, IX, 80; XIII, 8.

Gilles P. de Roberval, XX, 616; XIII, 8, 9.

John Wallis, XXIV, 352.

Christian Huygens, XII, 431.

Isaac Barrow, III, 341; XIII, 9.

Sir Isaac Newton, the inventor of the binomial theorem and of fluxions, XVII, 449; XIII, 10.

James Bernoulli, III, 522.

John Bernoulli, III, 523.

Leonhard Euler, demonstrator of the binomial theorem, VIII, 583.

Jean le Rond D'Alembert, discoverer of "D'Alembert's Principle," VI, 682.

Joseph L. Lagrange, XIV, 208.

Pierre S. Laplace, XIV, 301.

Jean B. J., Baron de Fourier, author of Fourier's theorem, IX, 433.

Carl F. Gauss, X, 104.

Jacques C. F. Sturm, author of Sturm's theorem, XXII, 645.

Sir William Rowan Hamilton, the inventor of quaternions, XI, 371.

James J. Sylvester, XXIX, 213.

George Boole, IV, 42.

And then read the following articles:

Numbers, Theory of, XVII, 629–39.

Numbers, Partition of, XVII, 629.

Infinitesimal Calculus, XIII, 6.

Quaternions, XX, 167.

The history of geometry is very briefly told in X, 334. Concerning great geometricians, it will be well, of course, to refer first to Euclid, the greatest of them all. Read his biography, VIII, 575. Then notice the following:

Geometry

Thales, XXIII, 235.

Theodosius, XXIII, 277.

Pythagorean contributions to the science of geometry, XX, 146.

Apollonius of Perga, II, 164.

Boetius on geometry, III, 743.

Legendre's work on geometry, XIV, 413.

This course can be supplemented by a reference to the article on Conic Sections, VI, 241.

For the history of Greek trigonometry, see XX, 92, under the article on Ptolemy; a brief notice of Indian and Arabian trigonometry is given in XXIII, 596, and an account of modern trigonometry in XXIII, 597. Of biographies, read the following:

Trigonometry

Hipparchus, Greek mathematician, XI, 760.

John Napier, inventor of logarithms, XVII, 183.

Edmund Gunter, inventor of the terms cosine, cotangent, etc., XI, 295.

Gottfried Leibnitz, XIV, 418.

Besides the mathematicians already

mentioned, there are several others whose biographies are given in the *Britannica*. . In order to acquire a complete knowledge of the history of the science, you should learn something about these men. Here is a partial list which, if you wish, you will be able to extend as you progress with the reading:

Men of Figures

Pappus of Alexandria, XVIII, 233.
Alhazen (11th century), I, 504.
Henry Briggs (16th century), IV, 310.
Thomas Allen (16th century), I, 513.
Simon Stevinus (17th century), XXII, 573.
Alexander Anderson (17th century), II, 14.
Gaspard Monge (18th century), XVI, 765.
Thomas Simpson, XXII, 94.
Robert Simson, XXII, 94.
Jakob Steiner (19th century), XXII, 559.
George Peacock, XVIII, 454.

For a popular course of reading in the history of mathematics, perhaps the foregoing is sufficient. Besides the four branches of the science already mentioned, there are others upon which the *Britannica* contains valuable articles intended particularly for specialists in mathematics. Several additional articles on mathematical subjects may be found under their own headings or by reference to the Index. The GUIDE ventures to name here the following, not that they should be included in any course of reading, but simply to remind the student of their presence in the *Britannica*, and to indicate where he may find them if occasion should require that he should refer to them:

Mathematical Topics

Abacus (arithmetical device), I, 11.
Calculating machines, IV, 580.
Squaring the circle, XXII, 450.
Annuities, II, 64.
Calculus of Variations, XXIV, 92.
The Almagest, I, 518.
Angles, II, 28.
Conic Sections, VI, 241–54.
Curve, VI, 632.
Infinitesimal Calculus, XIII, 6.
Functions, IX, 717; XIV, 209, 413.
Geodesy, X, 146.
Gauging, XVI, 32.
Logarithms, XIV, 779.
Measurement, XV, 665.
Mechanics, XV, 683.
Numbers, Theory of, XVII, 629.
Numbers, Partition of, XVII, 629.
Quaternions, XX, 167.
Surveying, XXII, 731.
Variations, XXIV, 92.
Probability, XIX, 788.
Projections, XIX, 814.
Surface, Congruence, Complex, XXII, 702.

CHAPTER XVI

Two Courses of Reading in Physics

COURSE I.

Physical science originally had reference to a knowledge of whatever exists in the material universe, as distinguished from metaphysical science, or a knowledge of the laws of mind. In this sense it was synonymous with natural science. With the progress of scientific study, however, each of these two terms has come to have a distinctive meaning of its own. Natural science now has reference more particularly to the study of organized bodies and their development. Physical science investigates the various phenomena observed in things without life; in other words, it is a study of the laws of matter.

Physical Science

Until recently the popular name for physical science was "natural philosophy." As now generally regarded, it includes two branches, mechanics and physics.

For readings in Mechanics, see the article on that subject in the fifteenth volume of the *Encyclopædia Britannica*. See also the chapters in this Guide entitled *The Mechanic* and *The Machinist*.

Since any knowledge of physics implies a study of the laws of matter, let us at first take a general survey of some of the most important of those laws.

What is matter? We do not know. But to gain some idea of the extent of human knowledge on this subject, read the articles Matter, XV, 639; Atom, III, 33; and Molecule, XVI, 632; VII, 187.

Matter

Some knowledge of the properties which matter possesses may be acquired by studying the following topics:

Molecule, XVI, 632; III, 35.
Inertia, XV, 683.
Constitution of Bodies, VI, 276.
Attraction, III, 55; XI, 59; XV, 710.
Adhesion, I, 140.
Elasticity, VII, 690.
Density, XV, 706; XII, 568.
Compressibility, VII, 707.
Divisibility, III, 33; XXVI, 425.

The relative properties of different kinds of matter are described in such articles as these:

Diffusion, VII, 186.
Cohesion, V, 50.
Gravitation, XI, 59; the law of gravitation, II, 682; Newton's discovery of this law, II, 660.
Capillary action, V, 50.

A consideration of the properties of matter relative to different forms of energy leads to a study of the following subjects:

Conductivity, XI, 515, 523 (thermal), and VIII, 49 (electric).
Specific gravity, XII, 568; Specific heat, XI, 514.
Color, VIII, 720.
Radiation, XX, 219.
Electric Waves, XXVI, 536.
X, or Roentgen Rays, XXVI, 539–41.

The laws and phenomena of matter are treated under many distinct divi-

sions; and hence in physics we find several related sciences, such as:

(1) Hydromechanics, or the laws of liquids, whether in equilibrium or in motion, XII, 451. Here are included:

Hydromechanics

Hydrostatics, referring to liquids at rest, XIX, 6; XII, 456; Hydraulics, or the action of liquids in motion, XII, 478.

Closely related to these subjects is that branch of mechanics called hydrodynamics, which is discussed in connection with them, XII, 451; XIX, 252.

(2) Pneumatics, or the science which treats of the properties of air and of gases in general, XIX, 252.

Many articles on related subjects might be read in connection with a study of this branch. The following will be found interesting and instructive:

Pneumatics

Gases, VI, 276; diffusion of, VII, 187; molecular theory of, III, 35; density of, XII, 460; laws of, V, 405; elasticity of, VII, 695.

Air, I, 379; aerostatics, IX, 268; aeronautics, I, 167; atmosphere, III, 26.

(3) Acoustics, or the science which treats of the nature, phenomena, and laws of sound, I, 93 (see general index); see also Music, XVII, 84, and many of the references in the chapter entitled *The Musician*, in this Guide.

Acoustics

Voice, XXIV, 293.

Telephone, XXIII, 137.

Phonometer, XXVIII, 409; Phonoscope, XXVIII, 409.

(4) Optics, or the science of light, XVII, 820. In connection with this subject read the following:

Optics

Light, XIV, 581; aberration of light, I, 50; reflection of light, XVI, 69; the velocity of light, XX, 635; polarization of light, XXVIII, 452; the theory of light, XXIV, 443, 468–71.

Mirror, XIV, 591; XVI, 523.

Lenses, XIV, 597.

Microscope, XVI, 268.

Telescope, XXIII, 146; Galileo's, II, 658, X, 28; Lord Rosse's, XX, 878; Herschel's, XI, 684; the Lick and the Yerkes, XXIX, 245.

Spectacles, XXII, 386.

Spectrometer, XVII, 824.

Spectroscope, XXII, 387.

Camera, IV, 654–55; XVIII, 853.

Eye, VIII, 713.

Aurora polaris, III, 79–86.

Rainbow, XI, 356.

Optical illusions, II, 179.

Vitascope, XXIX, 455.

Mirage, XIV, 604.

(5) Heat, XI, 495. The reading of this long and admirable article may be supplemented by a study of the following references:

Temperature (see general index).

Thermometer, XI, 500.

Theory of heat, XIX, 6.

Heat

Conduction of heat, XX, 219.

Convection of heat, XX, 219.

Heat as the equivalent of force, XV, 656.

Power of heat in mechanics, XV, 783.

Steam, XI, 499; properties of, XXII, 502.

(6) Electricity and Magnetism. See Chapter XXVI, entitled *The Electrician*, in this Guide.

COURSE II.

The late Professor J. Clerk Maxwell, in the article on the Physical Sciences which he contributed to the *Encyclopædia Britannica*, Vol. XIX, 5–7, presented a classification somewhat different from

the above. Physics includes what he calls the secondary physical sciences. A study of these sciences embraces the acquisition of knowledge relative to the following topics, and in the order here named:

(1) *Theory of gravitation* (XI, 59; III, 56), with discussions on the weight and motion of bodies near the earth. See Motion, XV, 761, and particularly XV, 708, 723, 754.

Weight and Motion

(2) *Theory of the action of pressure and heat* in changing the dimensions and state of bodies.

Heat

(a) Physical states of a substance—gaseous (VI, 276), liquid (VI, 277; XII, 478), solid (XIX, 252).

Elasticity, VII, 690; of gases, VII, 695; of liquids, VII, 695; of solids, VI, 276.

Viscosity, VII, 695; of gases, XVI, 641; of solids, XXII, 629.

Plasticity (of solids), XVI, 69.

Capillarity, I, 140.

Tenacity (of solids), XVI, 393.

Cohesion and adhesion, I, 140.

(b) Effects of heat in raising temperature (XV, 783), altering size and form (XVI, 71; XIX, 6), changing physical state (XXIII, 303; XXII, 490).

(c) Thermometry, XI, 498; XXIII, 308.

(d) Calorimetry, XX, 138; XI, 496.

(e) Thermodynamics, XXIII, 303; XXII, 497; XV, 656.

(f) Dissipation of energy (XXIII, 306) by diffusion of matter, etc.

Diffusion of motion (XXIII, 577; VIII, 188) by internal friction of fluids (XII, 506; XIX, 247).

Diffusion of heat (VII, 257) by conduction (XX, 219).

Sound

(g) Theory of propagation of sound, I, 94.

Vibration of strings, etc., XVII, 112; I, 108.

(3) *Theory of radiance.*

(a) Geometrical optics, XVII, 820.

Theory of conjugate foci, XVII, 822.

Optical instruments, XVII, 825, 830.

(b) Velocity of light, II, 697; XXIV, 484.

Radiance

(c) Prismatic analysis of light, XIV, 596, 617.

Spectroscopy, XXII, 387.

Fluorescence, XIV, 583, 607.

(d) Diffraction of light, XXIV, 452, 466.

(e) The wave theory of light, XIV, 608.

(f) Polarized light, XIV, 616.

(g) Theory of primary colors, VIII, 720.

The spectrum, XIV, 596, 599.

(4) *Electricity and magnetism.*

(a) Electrostatics, VIII, 14–15, 22–34.

(b) Electrokinematics, or distribution of currents in conductors (see index, VIII, 98).

Electrolysis, VIII, 99.

Magnetism, Etc.

Electro-chemistry, VIII, 13, 112; VI, 744.

(c) Magnetism, XV, 219.

Terrestrial magnetism, XVI, 164.

Diamagnetism, XV, 246, 264; IX, 249.

(d) Electro-magnetism, VIII, 62.

CHAPTER XVII

Readings in the Study of Man

"The proper study of mankind is man."—*Pope.*

Divisions of the Subject

A complete study of Man in all his various relations to the animal and spiritual worlds would embrace an investigation of many branches of knowledge, each occupying a distinct field of its own, but each dependent to a greater or less extent upon its kindred sciences. Among these branches the following are the most important:

1. Anatomy, which treats of the structure of the human body, I, 700.

2. Physiology, which treats of the functions and relations of the different parts of the body, XIX, 11.

3. Psychology, which investigates the operations of the human mind (see references in chapter entitled *The Teacher*).

4. Philology, which deals with the general principles of language (see chapter on that subject in this Guide).

5. Ethics, which treats of man's duty to his fellow-men (see references in chapter on *Philosophy* in this Guide).

6. Sociology, which treats of the origin and development of human institutions, VIII, 544; XVIII, 809; XIX, 360.

7. Religion, which deals with man's relations to the spiritual world, and his duties to God (see the chapter entitled *The Preacher and Theologian*).

8. Anthropology, the natural history of man, II, 94.

9. Ethnography and Ethnology (properly subdivisions of Anthropology), which deal with the subdivisions of the human race, such as hordes, clans, tribes, nations, etc., VIII, 539.

10. Archæology and Antiquities, which treat of the early history of man, and of the remains of ancient art, II, 118–19, 291–321.

11. History (see Chapter VI in this Guide).

It is proposed to indicate in the present chapter a few courses of reading from the *Britannica* which shall cover only the subjects numbered 6, 8, 9, and 10, above.

I. Anthropology.

Origin of Man

Let us take as the basis of our studies the comprehensive and scholarly article by Professor E. B. Tylor in volume II, pages 94–109. As to man's place in nature, refer to the article Animal Kingdom, II, 44. Portions also of the following articles may be read: Physiology, XIX, 11; Histology, XII, 6. See also XV, 451, and the articles on

Evolution, VIII, 652.
Heredity, XXVII, 275.
Charles Darwin, XXVI, 358.
Ape, II, 130.
Man and Monkeys, II, 94.

Concerning the origin of man, see the following: I, 125; X, 257; II, 291, 298; also the myths of his creation, III, 123; XVII, 164. Read also the section on this subject in II, 97.

The chapter on the races of mankind, II, 94–98, may be supplemented by the references under Ethnology, below.

Concerning the antiquity of man, read the sections in X, 327, and II, 101; then see the references under Archæology, below.

Read the section on language, II, 104–06; also the following:

Language

Evolutionary theories of language, VIII, 673.

Relation of language to thought, XX, 80.

Relation of language to mythology, XVII, 144.

See Chapter VIII in this volume.

Study next the development of civilization and culture. Read section vi, volume II, pages 106–109; and also what is said of the earliest seats of civilization, II, 299, and of Buckle's theory of civilization, IV, 378.

Culture

II. ETHNOLOGY.

Read by sections the article entitled ETHNOGRAPHY, VIII, 539–50. (Observe the distinction between Ethnography and Ethnology, p. 539.) The following are a few of the articles or sections which will be found interesting in connection with this study.

Races

The Family, IX, 17.

Tribes among Primitive Races, IX, 19.

Races of mankind, II, 98.

Ages of man, II, 108; also II, 294–300.

Food, VIII, 541.

Fire, IX, 198–202.

Religious Development, see Chapter LIV, entitled *The Preacher and Theologian*, in this volume.

Myths and Legends, VIII, 547–48, 732–35; XVII, 143; XXIII, 33; IX, 313.

Magic, XV, 200.

Superstitions, VIII, 547. See also the references named in Chapter XX of this GUIDE.

For the characteristics which distinguish man in different countries, see under the head of each country. For example, for Man in Africa, see the article Africa, I, 233; XXV, 64, 67, 72–75. So also we shall find,

Characteristics

Man in Algeria, I, 497;

Man in America, I, 602;

Man in Arabia, II, 214;

Man in Asia, II, 609;

Man in Austria, III, 103;

and so on, for every country of importance in the world.

Some curious races are also described in an entertaining way:

The Natives of the Andaman Islands, II, 12.

The Hottentots, XII, 323.

The Bushmen, IV, 512.

The Bongo, IV, 29.

The Ainos of Japan, I, 378.

The Dyaks, IV, 51.

The Czechs, VI, 665.

The Copts, VI, 314.

The Cossacks, VI, 396.

The Natives of Anam (ugliest in the world), VI, 87.

The Eskimo, VIII, 480.

The Natives of Polynesia, XIX, 435.

The Pueblo Indians, XXVIII, 515.

Half-breeds of Manitoba, XXVII, 214.

Concerning the origin of justice and morals, and their development among primitive peoples, see VIII, 548. Also marriage, XV, 572; IX, 18; totemistic marriage ceremonies, XXIII, 499; marriage among ancient Mexicans, XVI, 221; myths relating to marriage, XVII, 165.

Customs

Cannibalism, IV, 712.

Totemism, XXIII, 496.

Ghost-dance of Indians, XXVII, 91.

See Frank H. Cushing, XXVI, 340.

See also the readings in SOCIOLOGY, suggested in this GUIDE, post, pp. 83, 86.

III. ARCHÆOLOGY AND ANTIQUITIES.

Under this head we shall include a brief survey of a few of the more interesting antiquities described in various articles in the *Britannica*. No attempt

Antiquities

will be made at classification. Read first the brief article on Antiquities, II, 118, and then turn to Archæology, II, 291. This latter article may be studied by sections in connection with the supplementary article on the same subject, XXV, 222. See also Egyptology, XXVI, 500; W. M. Flinders Petrie, XXVIII, 396.

Then read, as occasion requires, or as inclination may direct, the following articles, which have been selected on account of their interest to general readers:

Antiquity of Man, II, 101.
Antiquities of America, I, 608.
The Mound-Builders, I, 607–09; III, 344.
Ancient American Architecture, II, 394.
Ancient Ruins in Yucatan, XXIV, 796.
Antiquities of Egypt, VII, 666–80.
Antiquities of Peru, I, 611; XVIII, 689–90.
Wall of Romulus, XX, 830.
Wall of Servius, XX, 831.
Wall of Antoninus, II, 122.
Wall of Hadrian, XI, 326.
Wall sculptures of Babylon, XVII, 40.
Wall decorations in Pompeii, XVII, 42–47.
Great Wall of China, V, 554–557.
Baalbec, III, 153.
The Temple of Bel, in Babylon, III, 158 b.
Nineveh, XVII, 525; II, 348.
Schliemann's researches in ancient Troy, II, 298; XXIX, 19.
Olympia, recent discoveries at, XVII, 786.
Mycenæ, ancient remains of, XVII, 121.
Cylopean masonry, II, 302, 352.
Remains of masonry in Ithaca, XIII, 527.
Tiryns, XXIII, 434.
General di Cesnola, XXVI, 101, and his discoveries in Cyprus, VI, 661, note.
Temple of Poseidon, XVIII, 137.
Temple at Bassæ, XVIII, 748–49.
The Palladium, XVIII, 192.
Painted Tombs of Corneto, VI, 375.
Mummies, XVII, 26.
Pompeii, XIX, 459.
Herculaneum, XI, 646.
Cave animals and Cave men, V, 231.
Prehistoric Stone Circles, II, 335.
Stone Monuments, Dolmens, etc., XXI, 56.
Stonehenge, XXII, 604.
Avebury, III, 125.
Carnac, V, 104.
Ancient Monuments in Peru, II, 395.
Stone Monuments in Polynesia, XIX, 442; XX, 285 (Rapanui).
Animal Mounds of Wisconsin, XXIV, 652.
Druidic Monuments, XXI, 57.
Ancient Barrows, III, 342.
Old Roman Roads, XX, 597.
The Catacombs, V, 179–189.
Ancient Stone Weapons, II, 485.
Ancient Inscriptions, XIII, 120–40.
Ancient Bottles, IV, 152.
Ancient Bracelets, IV, 169.
Ancient Bricks, IV, 249.
Ancient Brooches, IV, 332.
Ancient Lamps, XIV, 247.
Ancient Mirrors, XVI, 524.
Ancient Baths, III, 375.
Ancient Mosaics, XVI, 876.
Ancient Relics, XX, 368.
Relics in connection with Christian thought and practice, XX, 370.
Remains of antique art, II, 118.
Ancient rings; earliest existing rings, cylinders, Roman rings, XX, 574; Episcopal rings, poison rings, XX, 575.
Ancient Plate (Assyrian, Etruscan, etc.), XIX, 189–193.
Ancient Writing Materials, XVIII, 147, 236.
Ancient Pottery, III, 164; XIX, 617–38.

Ancient Textiles, Weaving in Prehistoric Times, etc., XXIII, 223.

Antiquarian Societies, II, 119.

Archæological Societies, XXII, 232.

Asiatic Societies, XXV, 271.

IV. SOCIOLOGY.

The following are a few of the articles or sections which will be found interesting or instructive in connection with this study:

Ethnography, section VI, on Social Development, VIII, 544–46.

Government, XI, 9–20.

Philosophy, XVIII, 809 b.

Political Economy, XIX, 359–415.

Comte's conceptions in sociology, VI, 210–212.

Statistics, XXII, 478–84.

Socialism, XXII, 216–32.

Sociological Societies, XXII, 238.

CHAPTER XVIII

READINGS IN PHILOSOPHY

PHILOSOPHY is a term the meaning and scope of which have varied greatly according to the usage of different authors and different ages. The aim of the courses of reading which we shall here attempt to indicate is to afford a general view of the history of philosophic ideas from the earliest times to the present, with a brief notice of some of the famous schools of philosophy, and of their influence upon modern thought. Of the large number of articles in the *Britannica* which may be utilized for this purpose, only those will be named which are the most essential to a general knowledge of the subject, or which are deemed to be of the greatest interest to the young student or the casual reader.

Definition

I. ETHICS.

The special article on PHILOSOPHY, XVIII, 805, may be made the starting-point and basis for these studies. This article, leaving controversial details as far as possible in the background, attempts to explain generally the essential nature of philosophy, and to indicate the main divisions into which, as a matter of historical fact, its treatment has fallen. After reading the first and second divisions of this article, pp. 805–807, let us make a brief study of the lives of some of the famous ancient philosophers, and of the different schools which they founded.

Ethics

But first, turn to the article on ETHICS, VIII, 506, and read the introductory paragraphs defining and giving a general account of this division of the subject. Read next the article on Thales, the earliest philosopher of Greece, and the founder of Greek astronomy and geometry, XXIII, 235. Then read the following articles in their order:

Pythagoras (580–500 B. C.) and Pythagoreanism, XX, 143.

Heraclitus of Ephesus (535–475 B. C.), XI, 607.

Democritus (470?–362? B. C.), VII, 53.

The Sophists, XXII, 277; The Age of the Sophists, VIII, 508.

Ancient Philosophers

Socrates (470–399 B. C.), XXII, 244; Socratic Schools, VIII, 509.

Aristippus, II, 445. The Cyrenaic School, VI, 662.

The Cynics, VI, 657; VIII, 510; Antisthenes, II, 120; Diogenes, VII, 214.

Plato, XIX, 205; VIII, 510; Platonism, I, 67; Plato and Aristotle, VIII, 512; Plato's school, VIII, 517; the Academy, I, 67.

Aristotle, II, 448; Aristotle's Ethics, VIII, 512; his logic, XIV, 791; his metaphysics, XVI, 85; the Peripatetics, XVIII, 556.

Epicurus, VIII, 419, 516.

Stoicism, VIII, 514; XXII, 589.

Seneca, XXI, 690–92.

Epictetus, VIII, 418–19.

Marcus Aurelius, III, 75.

Neoplatonism, XVII, 341; VIII, 517.

Mysticism, XVII, 136.

Christian ethics, VIII, 518; faith, VIII, 519; love and purity, VIII, 519.

Alexandrian school, I, 439.

St. Augustine, Christian philosopher, III, 66.

St. Ambrose, I, 582.

Scholastic philosophy, XXI, 435.

Thomas Aquinas, II, 201.

Albertus Magnus, I, 401.

Abelard, I, 38.

Bernard of Clairvaux, III, 619.

Grotius, XI, 193.

Modern Philosophers

Hobbes and his "Leviathan," XII, 33.

Descartes, VII, 100–111.

The Cambridge Moralists, VIII, 526.

Henry More, XVI, 841.

John Locke, XIV, 758.

Spinoza, XXII, 415–19.

Shaftesbury, XXI, 767.

Bernard de Mandeville, XV, 479.

David Hume, XII, 360.

Adam Smith, XXII, 179.

The Intuitional School, VIII, 531.

Dugald Stewart, XXII, 574.

Utilitarianism, VIII, 533; XXIX, 411.

William Paley, XVIII, 185.

Jeremy Bentham, III, 496.

Immanuel Kant, XIII, 853.

Johann Gottlieb Fichte, IX, 117–21.

Georg Friedrich Hegel, XI, 546.

John Stuart Mill, XVI, 320; XXIX, 412.

Auguste Comte, VI, 204.

Arthur Schopenhauer, XXI, 469–79.

Pessimism, XVIII, 698–704.

Herbert Spencer, XXIX, 136.

Ralph Waldo Emerson, I, 639; XXVI, 568.

Transcendentalism, XXIX, 309.

Finally, this study of ethics may be brought to a close by reading the concluding paragraph on that subject in XVIII, 809 a.'''

II. METAPHYSIC.

Definition

Metaphysic is "the science which deals with the principles which are presupposed in all being and knowing, though they are brought to light only by philosophy." According to Aristotle it includes also theology, the science of God. It is treated at considerable length by Professor Caird, of Glasgow, in XVI, 85–108.

References

See the references given above for Aristotle, the Sophists the Socratic school, Neoplatonism, Kant, Locke, etc. Read also the following articles:

Neoplatonism, VIII, 517; XVII, 341–48.

Manichæism, XV, 489–95.

Scholasticism, XXI, 435–49.

Bacon, III, 173; XXIII, 263.

Descartes, VII, 100.

Spinoza, XXII, 415.

Fichte, IX, 117; XX, 302.

Animism, II, 49.

Realism, XXI, 436; XXVIII, 557; see also Hamilton, XI, 372; Schopenhauer, XXI, 478; Pessimism, XVIII, 698–704; and Universals, XXI, 436 *et seq.*

Idealism, XXVII, 356.

Altruism, XXV, 151.

Analytic Judgments, I, 699.
Association of Ideas, II, 638.
Antinomy, II, 114.

III. PSYCHOLOGY.

Psychology, "the science of the phenomena of the mind," is the subject of a long and very learned article by Professor Ward, of Cambridge University, XX, 42–90. It may be read by sections with collateral references to the articles treating of the lives and works of the men who have done most for the development of this science.

Modern Psychology

See the references given above for Locke, Hume, Mill, and many others.

Read also the following articles:
Berkeley, III, 508.
Herbart, XI, 642.
Leibnitz, XIV, 418.
Sir William Hamilton, XI, 371.
Herbert Spencer, II, 641.
Bain, I, 201; III, 461.
Association of ideas, II, 638.
Analytic judgments, I, 699.
Belief, III, 459.
Imagination, XX, 62.
Feeling, XX, 45, 71, 79.
Abstraction, I, 59.
Absolute, I, 58.
Analysis and Synthesis, I, 695.
Attention, III, 46, etc.
Psychology, XXVIII, 513.
James Sully, XXIX, 192.
Telepathy, XXIX, 242.
Magnetism, Animal, XV, 279–85.

Psychology in relation to ethics, VIII, 506; in relation to logic, XIV, 787; to metaphysics, XVIII, 862; to evolution, VIII, 670; to religion, XXIII, 293.

Aristotle's Psychology, II, 459.
Plato's, XIX, 213.
The Stoics', XXII, 593.
Xenocrates's, XXIV, 755.
Descartes', VII, 109.
Hume's, XII, 365.
Leibnitz's, XIV, 422.
Kant's, XIII, 857.
Hegel's, XI, 551.
Cousin's, VI, 466.
Lewes's, XIV, 490.

See additional references to this subject in Chapter LVIII, entitled *The Teacher*, in this GUIDE.

IV. LOGIC.

Logic is the systematic study of thought. The subject is discussed in a comprehensive and scholarly article by Professor Adamson, of Manchester, in Volume XIV of the *Britannica*, pages 787–812. Aristotle's contributions to the development of this science are briefly noticed in II, 453–55.

Logic

Hutcheson's in XII, 426.
Condillac's in VI, 223.
Gilbert de la Porrée's in X, 529.
Leibnitz's in XIV, 422.
Hegel's in XI, 551.
Kant's in XIII, 862.
Lully's in XV, 65.
Hamilton's in XI, 374.
John Stuart Mill's in XVI, 324.
Whately's in XXIV, 559.
Boole's in IV, 42–43.
De Morgan's in VII, 57–59.

The various terms and distinctive expressions used in the science are defined and discussed, sometimes separately, each under its own head, and sometimes in a comprehensive treatise upon some general topic. For example:

Terms

A priori and a posteriori, II, 187.
Reductio ad absurdum, I, 59.
Accident, I, 79.
Analogy, I, 694.
Reality, XIV, 805–806.

Analysis, I, 695, 698.
Reason, XIV, 787.
Association of Ideas, II, 638–42.

See the references given above for Aristotle, Kant, Mill, Hegel, etc.

Read also the following articles or paragraphs:

Lotze, XV, 13.
Ueberweg, XXIII, 763.
Condillac, VI, 221.
Ulrici, XXIII, 768.
Analytics, XIV, 792.
Dialectics, XIV, 793; II, 453.
Deduction, I, 699.
Induction, I, 699; XIV, 792.
Syllogism, XIV, 796.

V. ÆSTHETICS.

The Beautiful

By Æsthetics is generally meant the science of the beautiful, with its allied conceptions and emotions. A brief survey of the subject and of the various problems which its study involves is given in a special article by Professor James Sully in I, 191–201. After reading the first two sections of this article, see the references given above for Socrates, Plato, Aristotle, and the other philosophers mentioned under the head of Ethics. Read next the chapter on the history of æsthetic systems, pp. 193–201.

This course of reading may be continued with a study of the short section on æsthetics, XVIII, 809.

Edmund Burke's work on the sublime and beautiful is briefly noticed in IV, 482. Jouffroy's theory, that the beautiful when considered apart from utility may be useless, is referred to in XIII, 764 a.' See also:

The nature of beauty, IX, 169.
Hutcheson on beauty, XII, 426.
Plato on beauty, XIX, 212.

VI. SOCIOLOGY.

Human Society

Philosophers will agree in telling us that for the content of morality we must refer, in great part, to the experience crystallized in laws and institutions, and to the unwritten law of custom, honor, and good breeding, which has become organic in the society of which we are members. Sociology, or the science of the development of human society, is brought therefore within the scope of philosophy. In some of its aspects it may indeed be regarded as a branch or subdivision of ethics. Many articles in the *Britannica* relate more or less directly to this interesting subject. The following may be studied with profit:

Antiquity of Man, II, 101.
Development of Civilization, II, 106.
Development of Culture, II, 107.
Family Development, VIII, 543.
Social Development, VIII, 544.
Association and Evolution, VIII, 534.
Relations of sociology to economics, XIX, 360.
Sociological conceptions of Comte, VI, 210.
Herbert Spencer's Social Statics, XXIX, 137.
Sociology in relation to Statistics, XXII, 481.
See also Sociological Societies, XXII, 238.

In connection with these readings, make use of the references to ethnology given in this GUIDE, p. 81.

CHAPTER XIX

Readings for Bible Students

"This course of reading Scripture and good books will be many ways to your great advantage."— *Richard Baxter*, 1660.

Sunday-school teachers, ministers of the Gospel, theologians, and all students of the Bible will find the *Encyclopædia Britannica* replete with information concerning all subjects connected with Bible history, biography, or geography. There is scarcely a proper name in the Old Testament or the New that is not the subject of a special article. The history of the Bible itself, with that of the critical problems connected with the books which compose it, is ably and fully discussed by Professor W. Robertson Smith in a thirteen-page article, III, 548–61. Many of the books composing the Bible are treated separately in a similar comprehensive manner. See the following:

Bible History

Pentateuch and Joshua, XVIII, 515–24. This article embraces a complete survey of the first six books of the Bible, with a careful discussion of the Mosaic law, and a notice of the most recent criticisms and opinions. In connection with this article it will be interesting to read what is said of Philo's "Exposition of the Mosaic Law," XVIII, 776 b.''

Books of the Bible

The Book of Judges, XIII, 773, and XIII, 410.

The Book of Ruth, XXI, 119.

The Books of Samuel, XXI, 265.

The First and Second Books of Kings, XIV, 85.

Chronicles, V, 613.

The Books of Ezra and Nehemiah, VIII, 728.

The Book of Esther, VIII, 494.

The Book of Job, XIII, 430, 708.

The Book of Psalms, XX, 33, and XII, 623.

The Book of Proverbs, XIX, 904.

The Book of Ecclesiastes, VII, 539.

Song of Solomon, V, 29.

Prophet, Prophets, XIX, 836.

Lamentations of Jeremiah, XIV, 241.

The Book of Daniel, VI, 707.

The Old Testament Canon, V, 3.

The Gospels, X, 702.

Acts of the Apostles, I, 114.

Epistles of St. Paul, III, 555.

Epistle to the Hebrews, XI, 538.

Epistle to the Romans, XX, 746.

Epistles to the Corinthians, VI, 354.

Epistle to the Galatians, X, 18.

Epistle to the Ephesians, VIII, 407.

Epistle to the Colossians, VI, 147.

Epistles to the Thessalonians, XXIII, 318.

Epistles to Timothy and Titus, XVIII, 353.

Epistle to Philemon, XVIII, 755.

Epistle of St. James, XIII, 563.

Epistles of St. Peter, XVIII, 710.

Epistles of St. John, XIII, 718.

Epistle of St. Jude, XIII, 771.

The Book of Revelation, XX, 510.

The New Testament Canon, V, 7.

Apocalyptic Literature, II, 153.

The Apocrypha of the Old Testament, II, 158; the Book of Baruch, III, 349; Esdras, VIII, 478; Judith, XIII, 775; Maccabees, XV, 132; Tobit, XXIII, 456.

Apocryphal Books of the New Testament, II, 161.

Israel, XIII, 406.

Moses, XVI, 888.

Miscellaneous Bible Topics

David, VI, 736.

Jews, XIII, 690.

Bible Concordance, VI, 214.

Bible Glosses, X, 612.

Versions of the Bible:

Versions

English, VIII, 341; Wycliffe's, XXIV, 744; Tyndale's, XXIII, 717; Coverdale's, VI, 471; the Bishops', VIII, 347; the Authorized Version, VIII, 347–48; Luther's, XV, 73; Geneva, VIII, 347; the Septuagint, XXI, 699; the Vulgate, III, 560; XIII, 642 a; the Roman Catholic version, VIII, 348 b''; V, 323 b.

Inspiration of the Bible, XIII, 161.

Circulation of the Bible, III, 548; XXV, 449–63.

The above-named articles, many of them long and all the work of Biblical scholars of high repute, if read in the order named, will constitute a complete course of study in Bible history and criticism. Theologians and advanced students will recognize at once their great interest and value.

The *Britannica* also contains innumerable briefer articles on subjects concerning which every Bible reader desires to be informed. The following is a partial list of such articles arranged alphabetically, according to the volumes in which they occur:

Shorter Articles

Volume I. Aaron, the first high priest, p. 11; Abel, the first man slain, p. 37; Abimelech, the title of certain kings in Palestine, p. 51; Abraham, the "father of the faithful," p. 54; Absalom, the rebellious son of David, p. 57; Adam, the first man, p. 124; Ahab, the wicked king of Israel, p. 373; Ahasuerus, king of Persia, p. 374; Amos, one of the prophets, p. 655.

Amalekites, p. 572; Ammonites, p. 651; and Amorites, p. 655 — tribes at war with the Israelites.

Abana and Pharpar, p. 12; Adullam, p. 152; and Ai, p. 376 — rivers or cities mentioned in the Old Testament.

Volume II. Athaliah, p. 724; Asa (Vol. XXV, p. 265); Apocrypha, p. 158; Ark of the Covenant, p. 473; Ararat, p. 271.

Volume III. Balaam, p. 223; Baruch, p. 348; Belshazzar, p. 477.

Volume IV. Cain, p. 570; Canaanites, p. 674; Cana of Galilee, p. 673.

Volume V. Canticles, p. 29; Chronicles, p. 613.

Volume VI. Daniel, p. 707; David, p. 736.

Volume VII. Deluge, p. 48; Decalogue, p. 15.

Volume VIII. Eli, p. 125; Elijah, p. 126; Elisha, p. 131; Emmaus, p. 163; Enoch, p. 400; Esau, p. 472; Esdras, p. 478; Esther, p. 494; Eve, p. 642; Ezekiel, p. 725.

Volume X. Galilee, p. 25; Gath, p. 98; Gilead, p. 531; Goshen, p. 701; Gideon, p. 525; Gog, p. 656; Bible Glosses, p. 612; the Gospels, p. 702.

Volume XII. Hittites, p. 27; Hosea, p. 309.

Volume XIII. Isaiah, p. 388; Israel, p. 406; Jeremiah, p. 637; Jesus Christ, p. 667; Jesus, son of Sirach, p. 683; Job, p. 708.

Volume XIV. Lamech, p. 238.

Volume XV. Manna, p. 500; Mark, p. 559; Mary, p. 596; Matthew, p. 640.

Volume XVI. Messiah, p. 58; Micah, p. 232; Michael, p. 234; Midian, p. 296; Moab, p. 557; Moloch, p. 722; Moses, p. 888.

Volume XVII. Nahum, p. 171; Naphtali, p. 181; Nathanael, p. 249; Nehe-

miah, p. 329; Nimrod, p. 524; Nebuchadnezzar, p. 319.

Volume XVIII. Paul, p. 425; Peter, 707; Pharaoh, p. 744; Philemon, p. 755; Philip, p. 756; Philistines, p. 769.

Volume XX. The land of Rameses, p. 277.

Volume XXI. Sabbath, p. 132; Samaria, p. 255; Samaritans, p. 256; Samuel, p. 264; Samson, p. 264.

Volume XXII. Simeon, p. 84; Simon Magus, p. 86; Sinai, p. 95; Solomon, p. 265; Synagogue, p. 850; Susa, p. 760.

Volume XXIII. Thomas, p. 328; Timothy, p. 425; Titus, p. 448; Tobit, p. 456.

Of the articles which relate to the geography of the Bible, the following are a few of the most important:

Sinai, celebrated as the place where Moses received the Law, XXII, 95.

Palestine, the "Promised Land," XVIII, 174, and XIII, 410.

Jerusalem, the holy city, XIII, 646.

Dead Sea, together with an account of the two cities, Sodom and Gomorrah, which are said to have occupied its site, VII, 3.

Bible Geography

Hebron, the ancient capital of Judea, XI, 542.

Bethlehem, the city of David, III, 533.

Bethany, the "town of Mary and Martha," III, 533.

Beersheba, the most southern town of Palestine, III, 435.

Samaria, XXI, 255.

Shechem, XXI, 819.

Nazareth, the town where Jesus lived, XVII, 312.

Gennesaret, otherwise called the Sea of Galilee, X, 27.

Gethsemane, XXVII, 89.

Capernaum, V, 49.

Joppa, XIII, 756.

Antioch, II, 115.

Damascus, the oldest existing city in the world, VI, 696.

The journeyings of the Israelites from Egypt to the Promised Land may be traced by reading the following references in their order: Starting from Rameses in Egypt, XX, 277, they fled to the Red Sea, XIII, 406. Here Pharaoh and his host were overthrown and drowned, but the Israelites, having crossed in safety, pursued their journey through the wilderness. For three days they had no water to drink, and arriving at last at Marah, XIV, 774, they found that the water in the springs there was bitter. This water was miraculously made sweet, and they continued their journey, finally reaching Sinai, XXII, 95, where the law was delivered to Moses. From Sinai they passed by various stations to Kadesh-Barnea, XXII, 860, and from that place sent out twelve spies to view the Promised Land. Being afraid to enter the Promised Land, they then turned back into the wilderness, where they wandered for forty years. At Mount Hor, XII, 163, Aaron died. While passing around Edom, XII, 737, they were attacked by fiery serpents. Arriving at last on the plains of Moab, XVI, 557, the Israelite army was reviewed and the law was confirmed by Moses. Moses viewed the Promised Land from the top of Mount Pisgah and died there. After this the people, under Joshua, crossed the Jordan, XIII, 756, encamped a short time at Gilgal, X, 532, and then marched against Jericho, XIII, 640, and Ai, I, 376. At Shechem, XXI, 819, they again encamped, and there the cursings were read from Mount Ebal, X, 399, and the blessings from Mount Gerizim, XXI, 256. Returning to Gilgal,

Journey From Egypt

a treaty was made with the people of Gibeon, X, 520. At Merom, XIII, 757, the northern Canaanites were signally defeated; and at Shiloh, XXI, 840, the twelve tribes were assigned to their respective possessions.

In much the same way we may follow the Apostle Paul in his voyage to Rome.

Paul's Voyage to Rome

He sets sail from Cæsarea, IV, 568; touches at Sidon, XXII, 41; thence proceeds to Cyprus, VI, 659, and to Myra, XV, 95, where he is transhipped to a corn vessel, which coasts along the shore of Asia Minor to Cnidus, VI, 43. Being caught by the wind, the vessel is driven to Crete, VI, 503, and follows the southern coast of that island to Fair Haven, VI, 504. Sailing thence to find a secure harbor for the winter, the vessel encounters the wind Eurokylon, XV, 342, and XXVI, 593; and, under shelter of the island Clauda, VI, 504, the sailors prepare for the storm by striking sail and turning the vessel's head to the wind. For fourteen days they are driven helpless across the sea, and are finally thrown upon the shore of Melita, XV, 849, escaping only with their lives. After three months, Paul sets sail in an Alexandrian corn ship, stops at Syracuse, XXII, 852, for three days; then, making circuit, passes Rhegium, XX, 353, and the next day lands at Puteoli, XVII, 195, where he rests a full week. Then he proceeds by the Appian Way, II, 184, to the city of Rome, XX, 824.

It is safe to say, in conclusion, that the earnest student of the Bible will find in the *Britannica* an answer to almost every question that may be asked concerning biblical subjects. From no other single work will he be able to obtain a larger amount of useful information at so little expenditure of time and labor. The *Britannica* is, in short, the great authority to which readers and students of every denomination or creed may turn with full confidence in its correctness and impartiality. See Chapter LIV, entitled *The Preacher and Theologian*, in this GUIDE.

CHAPTER XX

READINGS IN MYTHOLOGY, LEGENDS, TRADITIONS, AND FOLKLORE

"Books are our household gods."—*January Searle.*
"Gods and goddesses, all the whole synod of them!"—*Antony and Cleopatra.*

I. MYTHOLOGY.

Definition

MYTHOLOGY is the science which examines the myths of cosmogony and of gods and heroes. A very scholarly exposition of this science is given by Andrew Lang in Volume XVII, pp. 143–65, of the *Britannica.* Students, however, who are not already somewhat familiar with the subject will prefer to read some of the shorter articles first; they will afterward be able to take up this entertaining and comprehensive disquisition, and read it with appreciation and delight. The following list includes a number of interesting and valuable articles, arranged for the most part in alphabetical order:

Myths of the creation, VI, 394, and

XVII, 163. Read also the chapter on cosmogonies, I, 407; and the article on MYSTERIES, XVII, 131–36.

Myths of the gods:

Greek and Roman

Apollo, II, 162.
Athena (Minerva), II, 727; XVI, 456.
Diana (Artemis), II, 562; VII, 144.
Hebe, XI, 530.
Hephæstus (Vulcan), XI, 605.
Juno (Hera), XI, 605; XIII, 788.
Jupiter (Zeus), XIII, 789; XXIV, 820.
Mars (Ares), XV, 576; II, 426.
Marsyas, XV, 582.
Mercury (Hermes), XI, 670; XVI, 36.
Nemesis, XVII, 341.
Neptune (Poseidon), XVII, 355; XIX, 574.
Saturn (Cronus), XXI, 335.
Uranus, XXIV, 12 a'''; XVII, 161.
Venus (Aphrodite), II, 151.
Vesta, XXIV, 209.

Northern

The Æsir, I, 189.
Odin, II, 594; XVII, 162.
Frey, I, 190.
Baldur, III, 238.
Niörd, I, 190.
Bragi, I, 190.
Thor, XVII, 162.
Freya, IX, 682.
Loki, XVII, 487.
Heimdal, I, 190, etc.
Asgard, II, 593.

Other Gods

Bel, III, 152.
Ashtoreth, II, 643.
Astarte, II, 643.
Merodach, XXIII, 256.
Ammon, I, 649.
Anubis, II, 128.
Bubastis, IV, 366.
Baal, III, 152.
Moloch, XVI, 722.
Ahriman, I, 376.
Dagon, VI, 671.
Anoukis, II, 80.
Athor, III, 13.
Buto, IV, 525.
Ra, VII, 620.
Osiris, VII, 620.
Isis, VII, 621 b.'
Serapis, XXI, 706.

For further references, see Chapter LIV, entitled *The Preacher and Theologian*, in this GUIDE.

II. LEGENDS.

Old Greek Stories

1. Closely allied to the myths of the gods — in fact, inseparable from them — are the legends of the ancient heroes. All are related in the *Britannica*, with now and then a pertinent inquiry respecting their origin, or a brief discussion concerning their interpretation. Here you may find the story of Achilles, whose "vengeful wrath brought woes numberless upon the Greeks," I, 89; of Acis and his love for the nymph Galatea, I, 92; of Actæon, hunted by his own hounds, I, 119; of Adonis, beloved by Venus, I, 148; of Adrastus and the war of the Seven against Thebes, I, 150; of Æacus, famed for his integrity and piety, I, 162; of Ægeus, the king of Athens, and of Ægina, the river-nymph, I, 163; of Ægis, the buckler of Jupiter, I, 164; of Ægisthus, the traitor, I, 164, and his betrayal of Agamemnon, "king of men," I, 244; of Æneas and his flight from Troy, I, 165; of Ajax Telamon and Ajax Oïleus and their bold exploits, I, 383; of fair Alcestis giving herself up to death to save the life of her husband, I, 406; of Alcinous and his Phæacian people, I, 415; of Alpheus, the river-god, I, 540, and his adventure with the nymph Arethusa, II, 428; of the Amazonian women, I, 575, brave warriors of the Colchian shore;

of Amphiaraus, I, 657, whose prophetic power did not save him from an early death; of Amphion, I, 679, the sound of whose lyre caused stones to move and form themselves into the walls of Thebes; of Amymone and the satyr, I, 686.

This takes us only through the first volume. Of the numerous classical legends narrated in the remaining volumes, it is unnecessary to name all. Any course of reading on this subject, however, ought to include the following:

Other Classical Legends

Anchises, the father of Æneas, II, 4.

Andromache, the wife of Trojan Hector, II, 21.

Andromeda, saved by Perseus from the jaws of a sea-monster, II, 21.

Antæus, giant and wrestler, overcome by Hercules, II, 89.

Antigone, the heroine of one of the most famous of the old Greek tragedies, II, 112.

The Argonauts and their famous voyage in search of the Golden Fleece, II, 436.

Ariadne, the fair maiden of Crete, II, 441.

Arion, the Greek bard and player on the cithara, II, 442.

Atalanta, the swift-footed huntress of Arcadia, II, 723.

Atreus, the father of Agamemnon, III, 44.

Atropos, one of the Fates, IX, 44.

Atys, the beautiful shepherd of Phrygia, III, 58.

The autochthones, or aborigines of Greece, III, 123.

Cadmus, the reputed inventor of letters, IV, 559.

Calchas, the wisest of soothsayers, IV, 580.

Calliope, the Muse of epic poetry, IV, 628.

The centaurs, or "bull-killers," fabled as creatures half man and half horse, V, 295.

Cerberus, the three-headed dog that guards the gates of Hades, V, 299.

Cupid and Psyche, VI, 625.

The cyclopes, a lawless race of one-eyed monsters, VI, 657.

Dædalus, the most famous artisan of prehistoric times, VI, 670.

Danaë, the mother of Perseus, VI, 702.

Danaüs and his fifty daughters, VI, 702.

Daphne, beloved by Apollo, VI, 723.

Deucalion, the Noah of the Greeks, VII, 116.

Dodona and its famous oaks, VII, 280.

Echo and her love for Narcissus, VII, 555.

Elysium, or the abode of the blessed, VIII, 144.

Endymion, and his perpetual sleep, VIII, 187.

The Epigoni, sons of the seven heroes who perised at Thebes, VIII, 423.

The Erinyes, or Furies, VIII, 464.

The Fates, IX, 44.

The Fauns, IX, 47.

The Furies, VIII, 464; IX, 738.

Ganymede, the cup-bearer of Zeus, X, 65.

The Giants, X, 510.

Glaucus, the fisherman who became a god, X, 603.

The Gorgons, X, 697.

The Graces, XI, 24.

The Harpies, XI, 438.

Hercules, the greatest of the heroes, XI, 649.

Hero and Leander, XI, 674.

The Hesperides, daughters of the West, XI, 695.

Iphigeneia, XIII, 217.

Jason, the leader of the Argonauts, XIII, 606.

Hyacinthus, the friend of Apollo, XII, 436.

Laocoön, the unfortunate Trojan, crushed by serpents, XIV, 292.

The Lapithæ, ancient race of Thessaly, XIV, 301.

Linus, who taught Hercules music, XIV, 684.

Medea, the enchantress, XV, 787.

Medusa, the Gorgon, X, 697.

Midas and the "golden touch," XVI, 290.

Milo, the wrestler, XVI, 335.

Minos, the Minotaur, and the Labyrinth of Crete, XVI, 500.

The Nymphs, XVII, 707.

Nestor, oldest of Grecian heroes before Troy, XVII, 363.

Orpheus, the sweetest of all Musicians, XVIII, 54.

Odysseus, or Ulysses, XVII, 749.

Pegasus, the winged horse of the Muses, XVIII, 479.

Pelias, king of Iolcos by the sea, XVIII, 485.

Penelope, the faithful wife of Odysseus, XVIII, 501.

Phaethon, son of Helios, XVIII, 740.

Romulus, the mythical founder of Rome, XX, 862.

Theseus, the great Athenian hero, XXIII, 314.

The Trojan war, XXIII, 619–20. See also Homer, XII, 111.

2. Of old English legends intimately associated with much that is best in our literature, there are several with which every student should be familiar. Among these are the following:

English Legends

Beowulf, VIII, 360 b″, 361 a‴; XX, 674.

King Arthur and his Knights of the Round Table, II, 568; XX, 657–66.

Lancelot of the Lake, XX, 660.

Merlin, the wizard, XX, 661.

Guy of Warwick, XI, 304.

Sir Bevis of Hampton, XX, 669.

Godiva, the fair lady of Coventry, VI, 470.

Fair Rosamond, XX, 870.

Whittington and his Cat, XXIV, 587.

3. Of Christian legends, some of the most interesting are:

Christian Legends

Lilith, the legendary wife of Adam, I, 127 b; VII, 55 b, 57 a.″

Saint Cecilia, V, 247.

Saint Christopher, V, 612.

Saint Denis, VII, 70.

Saint George and the Dragon, X, 386.

The Holy Grail, XI, 31.

The Wandering Jew, XIII, 684–85.

The Flying Dutchman, XIII, 685 a″; XXIV, 334 b (*Der Fliegende Hollander*).

Saint Nicholas, XVII, 496.

Saint Veronica, XXIV, 189.

Seven Sleepers of Ephesus, XXI, 730.

Prester John, XIX, 734–37.

4. Of other famous legends the number is too great for anything like a complete list to be given. Among those referred to or narrated in the *Britannica* the following may be mentioned:

Miscellaneous

Adam's Peak in Ceylon, I, 129.

The Tower of Babel, III, 155.

The Story of Lohengrin, XXIV, 336.

The Story of Tannhäuser, XXIII, 51.

Find, or Fingal, the Celtic hero, IX, 187.

Roland, the French hero, XX, 641.

The Cid, famous in Spanish story, V, 675.

Amadis of Gaul, I, 571; XX, 670–73.

Palmerin de Oliva, XX, 673 a–74.

Havelok, the Dane, XX, 674; VIII, 366 b.

Ogier, the Dane, XX, 668.
Prester John, King of Abyssinia, I, 64; XIX, 734.
The Legend of Dr. Faustus, IX, 49.
Legends of Atlantis, III, 25.
William Tell, XXIII, 171.
The Beast Epic of Reineke Vos, VIII, 734.
The Pied Piper of Hamelin, XI, 365; XXV, 616.
The Nibelungen Lied, XVII, 487.
The legends peculiar to different countries are also noticed in their appropriate places, as:
Legends of Afghanistan, I, 213.
Legends of Arabia, II, 222.
Legends of Central America, I, 617, etc.

5. *Fairy Stories and Folk Tales.*—For special articles, see VIII, 747; XXIII, 32–34. See also the following sections, paragraphs, and short articles·
Fairies, II, 178.
Brownies, II, 178.
Fairies in Celtic literature, V, 282.
Morgan, the Fay, V, 282.
Oberon, XVII, 724.
Charles Perrault, XVIII, 568; XXIII, 32 b.'
The Brothers Grimm, XI, 178 a.
Hans Christian Andersen, XXV, 184.

6. *Fables.*—See special article, VIII, 732.
Sanscrit fables, XXI, 301.
Æsop, the Greek fabulist, I, 190.
La Fontaine, the French writer of fables, XIV, 204.
Kriloff, the Russian collector of fables, XIV, 149.

CHAPTER XXI

Readings in the Study of the Supernatural

"To make modern and familiar, things supernatural and causeless."
—*All's Well that Ends Well.*

In this chapter it is proposed to point out to the reader a few of the most interesting articles in the *Britannica* relating to supernatural phenomena, the occult sciences, magic, mystery, superstition, etc. No attempt will be made towards a classification or logical arrangement of the subjects, nor is it possible to present anything approaching to a complete list of the articles and parts of articles which relate directly or indirectly to the supernatural. But it is believed that every student will find in these readings matter that will afford entertainment and instruction.

Occult Sciences

Before the era of modern science, the belief in the supernatural held a much larger place in the estimation of mankind than it is possible for it to hold again. Alchemy, astrology, and magic reigned undisputed, and knowledge of every kind was tinctured with superstition. Let us begin our readings, therefore, with selections from articles relating to these defunct sciences.

1. Alchemy has been very aptly described as "the sickly but imaginative infancy through which modern chemistry had to pass before it attained its majority." See the very interesting article on this subject, I, 406–14. Read also the following articles and selections:

Alchemy

Paracelsus, XVIII, 238.
Jakob Böehme, III, 740.
Hermes Trismegistus, XI, 671.
Alexander of Aphrodisias, I, 429.
Roger Bacon, III, 188; I, 168.
Albertus Magnus, I, 401.
Cornelius Agrippa, I, 371.
Raymond Lully, XV, 64.
Arnold of Villeneuve, II, 542.
The Rosicrucians, XX, 875.
Cagliostro, IV, 569.
Alembic, I, 422.

2. Astrology was the forerunner of the modern science of astronomy, and, like alchemy, was not altogether unproductive of good results. For a general history of this interesting subject, see the special article in volume II, 646–50. Also, consult the following short articles:

Astrology

Horoscope, XV, 207.
Zodiac, XXIV, 829; VII, 475.
William Lilly, XIV, 649.
Nostradamus, XVII, 611.
Robert Fludd, IX, 305.
John Dee, VII, 21.
Michael Scott, XXI, 490.
Girolamo Cardan, V, 80; II, 648.
Napier's belief in Astrology, XVII, 190.
Astrology among the Parsees, XVIII, 331.

3. Necromancy. An important article on magic, its history and influence, may be found in XV, 200.

Magic

Magic among prehistoric nations, VIII, 547.
Egyptian Magic, XV, 201.
Babylonian and Assyrian Magic, XV, 202.
Greek and Roman Magic, XV, 202.
Magic among Asiatic Nations, XV, 204.
Magic in Christendom, XV, 205.
Necromancy in England, VII, 21.
Divination, or the art of discovering secret or future things by preternatural means, VII, 254.

Superstitious Beliefs

Augury, or the art of discovering through natural signs the will of the gods, III, 63.
Palmistry, the art of divining personal history from the lines in the palm of hand, XXVIII, 321.
Ordeal, or the mediæval method of discovering the will of God, XVII, 842.
Dreams and their interpretation, VII, 391, 255 a.
Lycanthropy, or the metamorphosis of men into wolves, XV, 90.

Mysticism

The mystical arrangement of letters, called Abracadabra, I, 54.
The mystical word Abraxas, I, 56.
The mystical ornament or charm, Amulet, I, 685.
The mystical science, Kabbalah, XIII, 820.

4. Demonology, or the influence of spiritual beings upon the affairs of men, VII, 53–57.

Witchcraft

Sorcery, or familiar intercourse with demons, VII, 56.
Witchcraft, XXIV, 653—a history of the laws and methods by which different nations have attempted to suppress this supposed crime.
Exorcism, or the means by which evil spirits are expelled, VIII, 705.

Evil Spirits

Devil, VII, 117.
Ahriman, I, 376; XVII, 882; XXIII, 257; Beelzebub, III, 434.
Asmodeus, II, 624.

Mephistopheles, XVI, 34.

Faust, the sorcerer of mediæval legend, IX, 49; X, 482.

Merlin, the wizard of Britain, XX, 661.

Apollonius of Tyana, philosopher and magician, II, 165.

Reginald Scot, English writer on witchcraft, XXI, 491.

Cotton Mather, the New England opponent of witchcraft, XV, 637.

Supernatural Influences

5. The history of the belief in supernatural beings and in supernatural influences may be further illustrated by reference to the following articles:

Mysticism, XVII, 136–42.

Angels, II, 25; II, 160.

Azrael, XXV, 312.

Raphael, XX, 286.

Gabriel, X, 5.

Michael, XVI, 234.

Apparitions, II, 176.

Astral Spirits, XXV, 279.

Ghosts, II, 179; XV, 200.

Spiritualism, II, 181; XXII, 419; the Fox sisters, XXVII, 18; Daniel D. Home, XXVII, 308; Robert D. Owen, XXVIII, 307.

Fetichism, II, 41.

Totemism, XXIII, 496.

Prophecy, XIX, 836.

Inspiration, XIII, 161; XIX, 208.

Second Sight, II, 176.

Hypnotism, II, 445.

Mesmerism, XV, 279.

Telepathy, XXIX, 242–43.

Theosophy, XXIII, 298–99; XXIX, 267.

Augury, III, 63.

Divination, VII, 254.

Bibliomancy, XXV, 464.

Divination by Cup, XXVI, 334.

The Sibyls, XXII, 18; XI, 129. See also Augurs, III, 63; Oracles, XVII, 831; XIX, 100.

Apotheosis, II, 174. See also Metempsychosis, XVI, 111.

Imaginary Beings

6. The popular belief in imaginary creatures, as set forth in very many of the classical legends, in the romances of the Middle Ages, and in the fairy tales and folklore of almost every nation in the world, is the subject of numerous articles.

The following are especially noticeable:

Genii, XXVII, 76.

Manes, XV, 485.

Lares, XIV, 313.

Penates, XVIII, 499.

Nymphs, XVII, 707.

Dryads, VII, 421.

Fauns, IX, 47.

Chimæra, V, 544.

Harpies, XI, 438.

Mermaids and mermen, XVI, 44.

Griffin, XI, 174.

Dragon, VII, 333.

Werewolves, XV, 91.

Fairies, VIII, 747.

Oberon and Titania, XVII, 724.

Morgana, V, 282.

Elves, VIII, 748.

Incubi and Succubi, VII, 55 b.'

Vampire, XXIV, 58.

Banshee, XXV, 352.

See the references to astrology in *Readings in Astronomy*, in Chapter IX of this GUIDE; also the references to alchemy in the chapter entitled *The Chemist*.

CHAPTER XXII

The Desultory Reader's Course

"Read what amuses you and pleases you."—*Robert Lowe.*
"Adjust your proposed amount of reading to your time and inclination."—*Dr. Thomas Arnold.*

Reading for Pleasure

To the person who takes pleasure (and who does not?) in browsing among the good things in books, without undertaking to read systematically, the *Encyclopædia Britannica* offers advantages which can be derived from no other publication. Here may be found all kinds of literary nuggets—readings on all manner of subjects—short articles, long articles—anything and everything to suit the demands of the hour. You need not attempt to follow any special course of reading; read only that which pleases you, and you may be sure that, whatever you may select from the *Britannica*, you cannot fail to be improved thereby. If your time is limited, choose something that is brief and light; if you are in a studious mood, take up a subject that will make you think, and that will be to your mind what brisk exercise is to your body. Among the thousands of articles with which you may thus occupy your spare moments, the following are mentioned merely as examples:

I. Curious Inventions, etc.

The automaton, III, 123.
The magic lantern (fully illustrated), XV, 212.

Inventions

The guillotine, XI, 233.
Tunneling, XXIII, 662 (illustrated).
Wax figures, XXIV, 486.
Horn-books, XII, 174.
Perfumery, XVIII, 536.
Balloons, I, 169.
Fire-engines, IX, 203, 204.
Hydraulic clock, V, 722.
Fire works, XX, 141.
Flying machines, I, 167.

II. Natural Curiosities, Scenery, etc.

Yellowstone National Park, XXIV, 773–75; XXIX, 618–20.

Nature

The Grand Cañon of the Colorado, Arizona, VI, 147; XXV, 237.
Petrified forest in Apache Co., Arizona, XXV, 237–38.
The Luray cavern, XV, 68.
The Mammoth cave, XV, 455.
Fingal's Cave, isle of Staffa, V, 231 a.
Niagara Falls, XVII, 485.
Whirlpools, XXIV, 571.
Whirlwinds and tornadoes, XVI, 134.
Geysers, X, 497.
Glaciers, X, 558.
Natural gas, XXVIII, 175.
Artesian Wells, XXV, 256.
Giant's Causeway, X, 511.
Tides, XXIII, 375.
Cave, V, 230–35.

III. Strange Animals and Plants.

Prehistoric monsters, XII, 734.
The ichneumon, XII, 665.
The dodo, VII, 278.
The honey-guide, XII, 143.
The sloth, XXII, 171.
Sea-serpents, XXI, 638.
Mermaids, XVI, 44.

Dragons, VII, 333.
Chimæra, V, 544.
Harpies, XI, 438.
Trees
Baobab tree, I, 240.
Sacred fig, IX, 135.
Upas tree, XXIII, 916.
Orchids, XVII, 839.

IV. CURIOUS CUSTOMS, ETC.

Deodands, VII, 87.
Ordeal of Fire and of Battle, XVII, 843.
April Fool Day, II, 187.
Curious Customs
May Day in Old England, XV, 654.
Hallowe'en, XI, 355.
Beltane, III, 478.
The Morris-Dance, XVI, 873.
Caste, V, 162.
Clans, V, 697.
Saturnalia, XXI, 336.
The Nile festival, VII, 630.
Exorcism, VIII, 705.
Fehmic Court (a secret tribunal in Germany, twelfth to sixteenth century), IX, 56.
Pillory, XIX, 104.

V. DEATH AND BURIAL.

Funeral rites, IX, 724.
Burial, IV, 480.
Embalming, VIII, 146.
Mummies, XVII, 26.
Wakes, XXIX, 468.
Cremation, XXVI, 307; VI, 500.
National cemeteries, XXVI, 95.
Tombs, XXIX, 297.
Mausoleum, XI, 342–43.
Suttee, XXII, 765.

VI. HISTORY AND BIOGRAPHY.

History of Flags, IX, 241.
Guilds, XI, 230–32.
The Man of the Iron Mask, XIII, 370.
Historical
Chevalier d'Eon, VIII, 404.
Alexander Selkirk, XXI, 670, b.′′′
History of Newspapers, XVII, 422.
Piracy, XIX, 125.
Mutiny on the Bounty, III, 717 a′′ XIX, 141.
Hypatia, XII, 631.
Semiramis, XXI, 671.
Aspasia, II, 624.
Field of the Cloth of Gold, II, 423.
The Spanish Armada, II, 476.
Great fires: in London, XIV, 835; in Chicago, V, 531; in Boston, IV, 66.
World's Fair, XXIX, 594.
International Exhibitions, VIII, 702; XXVIII, 323, 329.

VII. MISCELLANEOUS.

James Holman, the blind traveller, XII, 106.
Zerah Colburn, the mathematical prodigy, XXVI, 226.
People and Things
Joseph Scaliger, "the greatest scholar of modern times," XXI, 378.
The Admirable Crichton, VI, 510.
Kaspar Hauser, the mysterious German youth, XI, 467.
Christian Heinrich Heinecken, the precocious child, XI, 560.
Dwarfs, VII, 489; XX, 126.
Siamese Twins, XVI, 791.
Heredity, I, 82.
Animal Magnetism, XV, 279.
Hypnotism, XV, 279–85.
The Malthusian doctrine, XV, 346.
Darwinism, XXIV, 85–92.
Cryptography, VI, 592.
White Magic (sleight of hand), XV, 207. See also Legerdemain, XIV, 415; Ventriloquism, XXIX, 428.
Pillar-Hermits, XVI, 727 a.′
Anabaptists, I, 690.
Flagellants, IX, 245.
Thugs, XXIII, 348.
Assassins, II, 631.
Story of the Tichborne Claimant, XXIX, 283.

PART III

THE BUSY WORLD

CHAPTER XXIII

The Manufacturer

"Active doer, noble liver,
Strong to labor, sure to conquer."
—*Robert Browning.*

Few subjects engage the attention of so large a number of busy men as does that of manufacturing. Who, indeed, is not either directly or indirectly interested in the making of things, either by hand or by machinery? You may not be a manufacturer yourself, but you are necessarily the patron of many manufacturers. You are the consumer of the products of various manufacturing industries, and very naturally you have a curiosity to know something about the processes by which these products have been evolved from raw material and made into their present forms of usefulness. The *Encyclopædia Britannica* will give you the desired information.

Maker or Consumer

If you are engaged in some particular line of manufacturing, the *Britannica* will add to your knowledge concerning it. It will tell you what are the best materials to be used, the most economical processes to be employed, and the most desirable qualities to be sought in the products which you design to manufacture. Besides this, it will probably give you a great deal of interesting historical information concerning the origin, development, and various fluctuations of the business in which you are engaged—information which, although not absolutely necessary to your success, may nevertheless add directly to your enjoyment and incidentally to your prosperity.

This subject covers so wide a field and embraces so many different industries that, within our limited space, we can do but little more than make bare references to some of the most important articles contained in the *Britannica*. Let us first notice some of the manufactures of

TEXTILE PRODUCTS.

1. Wool and Woolen Manufactures is the title of a special article, XXIV, 687. The first part of this article, relating to the early history of the woolen industry, will interest every reader. See next the article on woolen manufactures in the United States, XXIX, 587, where the latest information and statistics are given. Now read what is said of

Wool

Wool fibre, IX, 115.
Bleaching of wool, III, 714.
Dyeing of wool, VII, 493.
Cassimeres, XXVI, 81.
Spinning, XXIV, 766; XIV, 670.
Loom, XXIV, 490; XXIII, 223, 228.

Turn to the illustrated article on Textiles, XXIII, 223, and read the interesting history there given of the art of weaving.

2. For an account of flax and linen manufactures, see XIV, 670.

Flax

The manufacture of linen in England, VIII, 210; in Ireland, II, 125, and XIII, 236; in Scotland, VII, 461.

Cultivation of flax in America, XXV, 94.

Bleaching of linen, III, 712.

3. For a complete history of cotton and cotton manufactures, see VI, 427.

Cotton

Cotton in the United States, XXIII, 880; XXIX, 364; in India, XII, 787; in Egypt, VII, 614, 681; in Brazil, IV, 204.

Cotton manufacture in England, VIII, 208; in India, XII, 800, 802; in Russia, XXI, 889.

Bleaching of cotton, III, 705.

Dyeing of cotton, VII, 497.

Cotton-spinning frame, II, 474.

Robert Owen's improvements in cotton spinning, XVIII, 90.

Cotton yarns, XXIV, 767.

The spinning-jenny, II, 474, and VI, 434.

The spinning-wheel, XXIV, 766.

Calico, VI, 433, 444.

Calico printing, IV, 606.

Ginghams, X, 539.

Gauze, X, 106.

Laces, XIV, 184.

See Samuel Slater, XXIX, 100.

Cottonseed and Cottonseed-oil, XXVI, 292.

4. For a history of silk and silk manufactures, see XXII, 61, 67.

Silk

Manufacture of silk in the United States, XXIX, 89; in England, VIII, 210; in India, XII, 800; in China, V, 555; in France, IX, 459; in Italy, XIII, 451.

Silk in ancient times, XXIII, 226.

Bleaching of Silk, III, 714.

The silkworm, IV, 530, and XIII, 157.

Silk from spiders, II, 259.

5. Miscellaneous.

Hosiery, XII, 312, and VIII, 211.

Knitting, XIV, 128.

Invention of the stocking frame, XII, 312.

Cloth, weaving of, XXIV, 489, 493.

Ancient weaving of cloth, XXIII, 223.

Improvements in looms, XXVII, 629.

Carpets, V, 112; Persian carpets, V, 113; XVIII, 636; Turkish, V, 113; Oriental, XXIII, 229.

Canvas, V, 36; canvas for sails, XXI, 161.

Straw manufactures, XXII, 622.

Rope-making, XX, 866.

Twine manufacture, XX, 867.

Rhea fibre, XX, 520.

MINERAL PRODUCTS.

1. Iron manufactures, XIII, 284.

Iron

Statistics of iron manufacture, XIII, 368; iron industry in the United States, XXIII, 868; XXVII, 401; iron as building material, IV, 400.

Strength of iron, XXII, 634.

The Blast Furnace, IX, 739; III, 475; XXVII, 403.

Melting-point of Metals, XXVIII, 67.

Puddling, XIII, 328.

Pig iron, XIII, 290, 313.

Cast iron, XIII, 287, 326.

Manufacture of steel, XIII, 368; strength of steel, XXII, 634; rigidity of, VII, 707; manufacture in the United States, XXIII, 882; XXVII, 407; use in ships, XVII, 295.

Bessemer steel, XXVII, 408.

Steel castings, XXVII, 411.

Nails, XVII, 172.

Screws, XXI, 578.

Locks, XIV, 750.

Galvanized iron, XIII, 366.
Foundry operations, IX, 423.
The casting of metal, IX, 423.
Rolling-mills, XIII, 337.
Wire, XXIV, 647; wire-drawing, XXIX, 572; strength of, XVI, 70; elasticity of, VII, 694, 697; telegraph wire, XXIII, 121; wire nails, XVII, 172; wire rope, XX, 868; wire netting, XVII, 369; wire fences, I, 276; wire-glass, XXIX, 572.
Stoves, XXII, 607.
Iron pipes, II, 193.
Pipe-making, XXVIII, 433.

2. Copper, VI, 308; copper wire, XXIV, 647.

Copper and Tin

Brass (alloy of copper and zinc), IV, 195; zinc, XXIV, 823.
Tin, XXIII, 427; strength of, XXII, 634.
Tin-plate, XIII, 367.
Tin-plate manufacture in the United States, XXIX, 290.
Can-manufacture and canners' tools, XXVI, 47.
Bronze (alloy of copper and tin), VI, 311.
Early casting of bronze, II, 304.
Strength of, XXII, 634.
Bronze work, XVI, 77.

3. Silver, XXII, 76.
Silver plate, XXII, 78.

Precious Metals

Silver plate work, XIX, 189.
Silvering, XXII, 78.
Silver wire, XXIV, 648.
Use of silver in mirrors, XVI, 523.
Silver lace, X, 671.
Silversmiths in Rome, II, 320.
Gold, X, 659.
Gold plate, XIX, 189.
Gold wire, XXIV, 648.
Gold thread, XXIII, 228.
Gold lace, X, 671; gold cloth, XXIII, 228.
Ancient workers in gold, XXIII, 228.
See now the chapter entitled *The Miner*, in this volume; also *The Railroad Man*, and *The Machinist*.

4. Pottery, XIX, 617; burning of, XX, 139; glazing, IV, 45.

Pottery

Pottery industry in the United States, XXVIII, 473.
Palissy's pottery, XVIII, 191.
Wedgwood's pottery, XXIV, 503.
Japanese pottery, XIII, 600.
Indian pottery, XII, 801.
The potteries, XXVIII, 473.
Kaolin, XIV, 3.
Porcelain, clay for, XIV, 3, and XVI, 442.
Chinese porcelain, XIV, 92.
Japanese porcelain, XIII, 600.
Limoges ware, XIV, 658.
Sèvres ware, XIX, 657.

5. Glass, history of, X, 576; XXVII, 106.
Manufacture of glass, X, 583.

Glass

Manufacture of glass in the United States, XXVII, 106.
Annealing, II, 57.
Colors of glass, XXIV, 449.
Painting on, X, 596.
Venetian glass-works, XVII, 54.
Glass-cutting, VII, 144.
Plate glass, X, 591; XXVII, 107.
Wire-glass, XXIX, 572.
Window glass, X, 588, 598.
Glass bottles, IV, 153, and X, 593.
Pressed-glass, XXVII, 107.
Mirrors, XVI, 523.
Lenses, XXIII, 150 a.'''

6. Leather, XIV, 380.
Artificial leather, XIV, 392.
Latest processes, XXVII, 562.
Shoemaking, XXI, 869.

7. Paper, XVIII, 221.
Papier-mâché, XVIII, 232.

Parchment, XVIII, 276.
Linoleum, XIV, 682.
Esparto, VIII, 483 b.'''

8. Flour, XXVI, 666; IX, 300; III, 216.
Bread, III, 215.
Cracknels, III, 218.
Macaroni, XV, 126.
The Canning Industry, XXVI, 48.
Raisins, XXIX, 455.
Sugar, XXII, 655.

Food Products

Sugar-making machinery, XXIX, 190.
Beet sugar, I, 339.
Glucose, XXVII, 111.
Maple sugar, XXVIII, 22.
Molasses, XXII, 659.
Salt, XXI, 239; XXIII, 870.
Animal foods, see Packing, XXVIII, 314, and Abattoirs, XXV, 11.

9. Brick-making, IV, 250.
Ancient bricks, XIX, 621, 638.
Glazed brick, XVII, 41.
Tiles, XXIII, 414; IV, 252.
Gutta-percha, XI, 301.
India-rubber, XII, 875, 880; Goodyear's inventions, XXVII, 125.

Miscellaneous

Rope-making, XXVIII, 618.
Straw manufactures, XXII, 622.
Baskets, III, 364.
Needles, XVII, 322.
Pigments—methods of manufacturing paints, XIX, 94.
Hats, XI, 462; straw hats, XXII, 622.
Gloves, X, 617; XIV, 389.
Pins, XIX, 106.
Button-making, IV, 533.
American watches, XXIX, 496.
Fans, IX, 25.
Furniture, IX, 745.

Very interesting are the accounts that are given of some of the great manufacturing centres, such as:

Manufacturing Centres

Manchester, the centre of the English cotton industry, XV, 467.
Birmingham, noted for its iron and steel works, III, 677.
Sheffield, famous for its cutlery, XXI, 822.
Philadelphia, and its extensive and varied industries, XVIII, 750.
Pittsburg, and its iron manufactures, XXVIII, 436.
Lowell, and its cotton mills, XXVII, 638.
Lawrence, and its cotton and woolen mills, XIV, 370.
Lynn, famous for the manufacture of shoes, XXVII, 651.
Boston, IV, 64; Newark, XVII, 379; Wilmington, XXIV, 621; Birmingham, Ala., XXV, 483; and scores of other manufacturing cities of similar importance.

For statistics and other information concerning manufactures in all the principal countries of the world, see the appropriate paragraph under the name of each country. For example:

Statistics

Manufactures in England, VIII, 208.
Manufactures in Germany, X, 412.
Manufactures in Arabia, II, 213.
See World's Fairs, XXIX, 594.
But the intelligent reader will require no further assistance from the GUIDE in finding such information.

CHAPTER XXIV

The Mechanic

"Thou art deeper read and better skilled."—*Titus Andronicus*

What constitutes the difference between the good artisan and the bungler?

Artisan or Bungler

Knowledge and skill. These may be attained in some degree by practice in the handling of tools; but that broader knowledge which leads to success, and that more perfect skill which wins distinction, can be acquired only through diligent study. The mechanic who would rise to a higher position in his calling must learn all about the nature of the materials with which he works; he must know what are the best tools to use, and why; he must understand the philosophy of the forces with which he deals; and he must seek to comprehend the natural laws which govern or regulate the operations connected with his particular handicraft. This is the kind of knowledge which enables the humblest workman to develop into the skilled artisan, the foreman, the manager, and the inventor.

Now, there is no other printed publication in the world which offers the means of acquiring so much of this kind of knowledge as does the *Encyclopædia Britannica*. There is hardly a single difficult problem connected with the laws of mechanics or of machinery which is not clearly explained in the *Britannica*. There is hardly a knotty question with reference to tools, materials, or products which is not elucidated or answered in one of these volumes. The successful mechanic will not always wait for these difficulties to present themselves. He

Mechanic's Helper

will study the principles of his trade and every detail concerning it, so as to be ready beforehand for all emergencies. Instead of running with childish questions to his foreman, he is ready himself to give instructions to those who are in need of them. His workmanship is of superior character. He is constantly improving, while his fellows who work without thought remain always on the same level. His greater knowledge leads to greater ability. His employer recognizes the greater value of his services. Promotion comes to him as a matter of course. Success and fortune are waiting for him—and all because he has made use of the opportunities for self-culture which lie within the reach of everyone who will take the trouble to secure them.

In these days there are so many kinds of handicrafts and so many classes of mechanics, that to mark out complete courses of study with relation to all would require more space than we have at command. But the *Encyclopædia Britannica* contains a vast amount of valuable information concerning every one of them; and it is the object of the Guide to help you to get at some of this information in a methodical way, and thereby make you the better able to carry on these studies independently and without aid.

Your first thought, no doubt, will be to turn at once to the article MECHANICS, XV, 683; but it will be better to leave this article until you have made a study of some of the materials and tools with which you propose to work. In this way you will gradually approach the difficult *science* of mechanics, and by and by be prepared to read portions of this exhaustive article with a more thorough appreciation than is now possible.

THE WOOD-WORKER.

Are you a worker in wood? Here are a few articles, or parts of articles, which you will read with pleasure and profit:

Wood Work

Lumber, IX, 355.

Strength of materials, XXII, 623; XXIX, 171.

Bending of plank, XV, 752.

Carpentry, IV, 426.

Sawing of wood, XXI, 359.

Joinery, IV, 433.

Fir, IX, 193.

Teak, XXIII, 110.

Hemlock, II, 280.

Spruce, IX, 193.

Oak, XVII, 709.

Pine, XIX, 110.

Poplar, XIX, 525.

Rosewood, XX, 874.

Mahogany, XV, 290.

Tools

The early use of tools, VIII, 542.

The plane, XI, 391.

The auger, XI, 392.

Other hand tools, XI, 390.

Machine tools, XV, 153.

Turners' tools, XIV, 324.

The hammer, XI, 379.

The lathe, XIV, 323.

Glue, X, 119, and IV, 437.

Veneering, XXIV, 150, and IX, 746.

Varnish, XXIV, 99.

Barrel-making, XXV, 368.

Wood-carving, XXIV, 678, and V, 147.

These are mentioned here simply as samples of the numerous articles wherein the wood-working mechanic will find practical information concerning the materials, tools, etc., of his handicraft. If you are a carpenter or builder, turn now to Chapter XXIX in this volume, entitled *The Builder*, and observe the long and valuable list of references there given.

THE METAL-WORKER.

The metal-worker will find that most of the above references are of direct importance to him also, and he will scarcely be willing to omit any of them from his course of reading. Besides these there are numerous others which he will regard as having a special value, referring, as they do, directly to the handicraft in which he is the most deeply interested. Here are a few of them:

Metal Work

Anvil, II, 129; XI, 380.

Smith-work in building, IV, 456.

Annealing, II, 57, and XIII, 362.

Forge, IX, 363; its history, XIII, 296; forging-machines, IX, 364.

Foundry, IX, 423; XIII, 365.

Bellows for smelting ores, XVI, 65.

Blast furnace, IX, 738; III, 474; XXVII, 403.

Iron, XIII, 284.

Iron as building material, IV, 400.

Iron-work in architecture, II, 410; XVI, 77.

Famous iron-works: at Barrow-in-Furness, England, III, 340; at Stafford, England, XXII, 459; at Neviansk, Russia, XVII, 378.

Iron bridges, IV, 300.

Nail-making, XVII, 172.

Tack-making, XXIX, 217.

Steel, XIII, 284; XXVII, 401.

Tube-making, IV, 196.
Valves, XXII, 523.
Wire-making, XXIX, 572.
Wire, XXIV, 647; wire-drawing, IV, 196.
Arms, II, 485; artillery, II, 572; rifles, XI, 249; rifling of cannon, XI, 261. (See Chapter XLI in this GUIDE, entitled *The Soldier.*)
Assaying, II, 633; XVI, 68.
Boilers for steam engines, XXII, 517; improvement in, for abating smoke, XXII, 190.
Brass, IV, 195.
Bronze, IV, 330.
Copper, VI, 308. (See Chapter XXXVII in this GUIDE, entitled *The Miner.*)
Electro-plating, VIII, 109. (See Chapter XXVI in this GUIDE, entitled *The Electrician.*)
Metallurgy, XVI, 62.
Metal work, XVI, 76.
Tin-plate manufacture in the United States, XXIX, 290.

THE LEATHER-WORKER.

There are mechanics who work neither in wood nor in metal. Of these, one of the most prominent is the man who works with leather, or with the prepared skins of animals. For him there are, in the *Britannica*, such articles as the following:

Work in Leather

Tanning, XIV, 381.
Tannin, XXIII, 52.
Leather, XIV, 380.
Buff leather, XXV, 634.
Cordovan leather, XXVI, 284.
Artificial leather, XIV, 392.
New process in making leather, XXVII, 562.
Shoemaking, XXI, 869.
Harness-making and saddlery, XXI, 150.
Stamped leather for wall decoration, XVII, 43.
Morocco leather, XIV, 388.
Russian leather, XIV, 388; III, 603.
Book-binding, IV, 36; XIV, 538.

THE PAPER-WORKER.

Then there is the worker on paper, who will find the following articles brimful of information:

Paper

Paper, XVIII, 221; manufacture of, XVIII, 223; bleaching of materials, III, 713.
Esparto, VIII, 483 b.'''
Ruling of paper, XXII, 478.
Wall paper, IV, 459; XVII, 44.
Papier-mâché, XVIII, 232.
Paper pulp, XVIII, 229, 230.
See the chapter in this volume entitled *The Laborer.*

THE STONE-WORKER.

Building-stone, XXV, 638.
Stone cutting and dressing, XXIX, 166.
Strength of building-stone, XXII, 634.
Plaster-work, IV, 451.
Cements, V, 285; IV, 411; XIV, 654.
Stone pavements, IV, 423.
Chimney-pieces, IV, 423.
Limestone, X, 206.
Marble, XV, 535.
Marble veneer, XVII, 41.
Sandstone, X, 212.
Granite, XI, 43.

See the references to labor and wages in Chapter XLIV, entitled *The Political Economist*, in this volume.

CHAPTER XXV

The Machinist

"He that loves reading has everything within his reach."— *William Godwin.*

Machines

In addition to the articles already mentioned in the chapter addressed to the Mechanic, the practical machinist will find a great many others which will be of direct and special aid to him in his calling. He will want to make a careful study of that portion of the article Mechanics which refers directly to the theory of machines, XV, 760. He will want to read what is said about their purposes and effects, XV, 781. There may be other portions also of the same article which will answer troublesome questions or difficult problems that come in his way, and to find what he needs he should refer to the index to the article, XV, 758. The article on Machine Tools, XV, 153, will have a special value to him. The supplementary article on special forms of machine tools, XXVII, 665, gives an exceedingly interesting description of some of the latest inventions of this class. See also Tool-making, XXIX, 301.

Steam-Engine

The Steam-Engine, XXII, 490, a very complete and comprehensive treatise (sixty-five pages, illustrated) written by Professor Ewing of Dundee, one of the most eminent of living authorities. Additional matter concerning the invention of the steam-engine by Watt may be found in XXIV, 433. The improvements made by Murdock are briefly noted in XVII, 60, and those of Trevithick, in XXIII, 589. See also Governors, XXVII, 133.

Various applications of the steam-engine are described: Its use in steamships, XXII, 543, XXI, 862, and XXVIII, 26; its use in locomotive engines, XX, 232, 254, XXII, 564, and XXVII, 618; its use in land carriages, VIII, 637; its application to farm machinery, I, 271, etc.

Hydro-mechanics

The article Hydromechanics, XII, 451; the application of water to mechanical purposes, as described in the chapters on Hydraulic Machinery, XII, 549, and XXVII, 348. The hydraulic press, XV, 761, and the history of its invention, IV, 192. The article on Calendar, IV, 605–606.

The description of Montgolfier's hydraulic ram, IV, 157.

The description of the hydraulic elevator (lift), XII, 550, XIV, 577, and XXVI, 550.

Of water motors in general, XII, 549.

Of water power in mechanics, XV, 783.

Of water wheels and their action, XII, 454, 553.

Late improvements in water wheels, XXIX, 503.

Pneumatics

Of the uses of air in connection with mechanics, read the article Pneumatics, XIX, 252; refer also to XII, 455, 462.

Its special application in air locks is noticed in XXV, 107; in the air-washer for extinguishing fires, XXVI, 647; in the pneumatic power transmitter, XV, 761; in pneumatic tubes, XII, 517; in the air-engine, I, 379; in the air-gun, I, 380; in the air-pump, XVI, 35; XIX, 257 b′′′; I, 380.

As to the application of air in propelling machinery, see Windmills, XXIV, 630; XV, 783.

Wind carriages, XXII, 573.

See also what is said about the wind in navigation, XVII, 282. In this connection it will be interesting to learn many important facts concerning the nature of air: Its composition, III, 29; its density, III, 329; its weight, III, 26; its other physical properties, XIX, 252.

Here, too, you may read of the efforts that have been made to navigate the air, I, 169, with a description of all the great balloons that have ever been constructed. Whether it is possible ever to build a successful air-ship no one can yet predict. The problem of aeronautics has, however, engaged the attention of inventors for many years, and the history of their efforts and experiments is in the highest degree interesting and instructive. Read of the invention of the balloon by Stephen and Joseph Montgolfier, I, 169; of the later experiments by Langley, Maxim, Chanute, Lilienthal, and others, XXV, 55; and of the aeronautic associations which have been formed for the encouragement of further experiments and inventions.

Balloons

But air is only a gas,—or rather a mixture of two gases, I, 379,—and much that is true with reference to its properties applies also to gases in general. And so the machinist who finds it necessary to become acquainted with the laws of pneumatics will not only study the properties of air in motion and at rest, but will learn all that he can about gases in general, VI, 276, their physical properties, XIX, 252, and their diffusion, VII, 187.

Of the application of gas to the purposes of machinery, see what is said about gas-engines, XXII, 550; expansion of gases by heat, XI, 512, and XX, 360; elasticity of gases, VII, 695; dilation of gases, III, 32; their molecular laws, XVI, 633.

Gas

Then read about the discovery and use of natural gas in the United States, XXIII, 870, and XXVIII, 175.

For a list of references relating to applications of electricity, see Chapter XXVI, in this volume, entitled *The Electrician.*

The meaning of the term "horse-power" and its application in practical mechanics is explained in XV, 782–83; and it is still further noticed in XII, 211, and XV, 723. The signification of the term when used in connection with steam-engines is made clear in XXII, 494, 511.

Horse-Power

There are still other forces which influence the action of machinery, and of whose manifestations and laws the machinist cannot afford to be ignorant. There is GRAVITATION, for example, the influence of which must always be considered when any system of machinery is contemplated. Study the article on this subject, XI, 59.

Laws of Mechanics

Then read of the discovery of the general law of gravitation, II, 660; of the various theories in relation to it, III, 56; of gravity in mechanics, XV, 709, 737; and of the discoveries of Archimedes concerning the centre of gravity, II, 332.

Still pursuing this line of study, read of the laws and effects of adhesion, I, 140; of cohesion, V, 50; and of elasticity, VII, 690.

The laws of friction must now claim your attention, and these you will find very fully treated in IX, 683, and XV, 709, 775. The action of friction in con-

nection with liquids is described in XII, 506, and with gases in XVI, 641.

The expenditure of energy in the overcoming of friction is explained in VIII, 188; and the influence of lubricants in preventing friction receives attention in XV, 37.

For an elaborate and very practical essay on STRENGTH OF MATERIALS, see XXIX, 171–85.

Dynamics

You are now ready for the article on DYNAMICS, or the science which treats of the action of force; and after that for the article on ENERGY, or the power of doing work, VIII, 187. Then read the following:

Force, VII, 502.
Motion, XV, 683, 761.
Momentum, XV, 684.
Velocity, XV, 687, 779.
Inertia, XV, 683, 756.
Laws of Projectiles, XXII, 52.

If you have followed this course of reading faithfully, you have acquired a comprehensive knowledge of those fundamental principles of mechanics which govern the action and modify the effectiveness of all machinery. Much of the reading has been difficult; it has required hard study to master it all. But now you will understand what is meant when it is said that it is the well-informed mind no less than the skilful hand that makes the successful mechanic. Knowledge never impairs one's ability to work, but it adds to that ability. Of course, knowledge cannot supply the place of energy and strength. A good mind must be aided by strong arms; a full memory must have the support of steady industry, or no worthy success can be attained. The best artisan is he who possesses a thorough knowledge of the foundation principles of his calling, while at the same time he has the trained hand and eye and the obedient muscle which can result only from long and patient training and experience,

See now, for further references, the following chapters in this GUIDE:

The Architect, The Builder, The Manufacturer, The Electrician, The Inventor, and Two Courses of Reading in Physics.

CHAPTER XXVI

THE ELECTRICIAN

"Every person has two educations, one which he receives from others, and one, more important, which he gives to himself."—*Gibbon.*

PRACTICAL electricians will find in the supplementary article on ELECTRICITY, XXVI, 506–47, a very comprehensive presentation of the entire subject as it is now understood. This article, which comprises forty pages, is very fully illustrated, and gives a complete outline of all the latest discoveries. It is invaluable to all persons who are in any way interested in this subject.

Special Article

The leading article on electricity, in the eighth volume of the *Britannica*, comprises almost one hundred pages—equal in amount of matter to an ordinary 12mo volume of nearly five hundred pages. For the sake of non-scientific readers it is introduced by a brief history of the science, wherein mention is made of some of the more striking electrical dis-

coveries, and of the steps by which our knowledge of the subject has advanced to its present condition.

FAMOUS ELECTRICIANS.

In connection with the above-named articles, the following notices of men who have contributed to the advancement of the science will be read with interest:

Dr. Gilbert (1540–1603), founder of the science, X, 528.

Robert Boyle (1627–91), one of the earliest experimenters, IV, 166–67.

Otto von Guericke (1602–86), XI, 218.

Sir Isaac Newton (1642–1727), XVII, 449.

Historical

Francis Hawksbee (died 1712?), VIII, 5.

Benjamin Franklin (1706–90), IX, 626.

Henry Cavendish (1731–1810), V, 236.

Coulomb (1736–1806), VI, 452.

Galvani (1737–98), discoverer of galvanism, X, 44.

Volta (1745–1827), inventor of the voltaic battery, XXIV, 304.

Ampère (1775–1836), I, 656.

Hans Christian Oersted (1777–1851), VII, 80; VIII, 10; XXVIII, 275.

Ohm (1781–1854), XVII, 759.

Michael Faraday (1791–1867), IX, 27.

Samuel F. B. Morse (1791–1872), XVI, 874.

Sir Charles Wheatstone (1802–75), XXIV, 568..

Cyrus W. Field (1819–1892), XXVI, 637.

Lord Kelvin (1824–), XXVII, 484.

Thomas A. Edison (1847–), XXVI, 488.

Nikola Tesla (1858–), XXIX, 256.

SPECIAL SUBJECTS IN ELECTRICITY.

Accumulators, I, 87.

Armatures, XXV, 241; drum armature, XXVI, 531.

Batteries: History of, VIII, 87–88; bichromate, XXVI, 543; Bunsen's, XXVI, 542; copper oxide, XXVI, 543; Daniell's, XXVI, 542; Grove's, XXVI, 542; Leclanché's, XXVI, 543; silver chloride, XXVI, 543; Voltaic, XXVI, 541.

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Condensers, XXVI, 516.

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Currents, XXVI, 517, 532.

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Dynamo electric-machines, XXVI, 529.

Dynamos, XXVI, 532.

Electric light in microscopy, XXVIII, 91.

Electric meters, VIII, 101.

Electrification, XXVI, 506.

Electrodynamic action, VIII, 10, 62, 98.

Electrolysis, or the decomposition of chemical substances by the agency of the electrical current, is dealt with in a comprehensive and scientific manner in VIII, 99–108.

A supplementary article on the same subject (see XXVI, 547–49) gives an interesting account of the latest discoveries and investigations in this branch of science.

Electromagnets, VIII, 62; XXVI, 520, 523.

Electrometallurgy, VIII, 108.

Electrometer, VIII, 110–16.

Electromotive force, XXVI, 518.

Electromotograph, XXVI, 549.

Electrophorus, VIII, 95; XXVI, 509.

Electroscopes, VIII, 111; diagometer, XXVI, 410.

Fan-motor, XXVI, 616.

Field-magnets, XXVI, 531.

Fluoroscope, XXVI, 668.

Galvanism, X, 44; XVII, 538.

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Induction, Electromagnetic, XXVI, 525.
Induction-coils, XXVI, 527.
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Insulators, XXVI, 507.
Intensity, XXVI, 512.
Magnetism, XV, 219; XXVI, 524; I, 656.
Ohm's law, VIII, 39–41.
Poles of electromagnet, XXVI, 525.
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Resonance, XXVI, 535.
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Volts and ampères, XXVI, 533.
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Ocean cables and submarine telegraphy, XXII, 295, and XXVI, 637 (Cyrus W. Field).
Telegraphs in the United States, XXIX, 239.
Telegraphic statistics, XXIX, 240.
Telautograph, XXIX, 238; writing telegraph, XXIX, 607.
The telephone, XXIII, 137.
Long-distance telephones, XXIX, 243.
Alexander Graham Bell, XXV, 415.
Thomas A. Edison, XXVI, 488.
Telephonic apparatus, XXIX, 244.
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Electric Motors

Electric motors, XXIII, 528, 541.
Latest improvements in electric motors, XXVIII, 149.
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Lightning arresters, XXVII, 598.
Niagara power plant, XXVIII, 242.
Electric elevators, XXVI, 550.
Electric police and fire-alarm systems, XXVI, 645.
Electric clocks, VI, 25; XXVI, 203.
Electric alarm thermometer, XXV, 111.
Electric piano, XXVIII, 420.
Electric regulator, XXVIII, 571.
Electric lighting, XIV, 637.
The fluorescent lamp, XXVI, 668.
Electric welding, XXIX, 517.

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Phonograph, XXIII, 140, 146; XXVIII, 408.
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Kinetoscope, XXVII, 497.
Vitascope, XXIX, 455.
See Chapter XXVII, in this GUIDE, entitled *The Inventor*.

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Magnetism, XV, 219; XXVI, 524; I, 656.
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The dipping-needle, XXVI, 422.
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Franklin's experiment with a kite, VIII, 7; Lightning conductor, XIV, 640.

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Aurora Borealis and Australis, or Northern and Southern Lights, III, 79–86.

Electricity in minerals, XVI, 391.

Connection of lightning with the aurora, III, 79, 84.

Sun-spots and magnetic disturbances, II, 688.

Easy experiments to illustrate electrical laws, VIII, 15.

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CHAPTER XXVII

The Inventor

"Neither the naked hand nor the understanding, left to itself, can do much; the work is accomplished by instruments and helps, of which the need is not less for the understanding than the hand."—*Bacon.*

Few persons have more to gain from self-culture than those who aspire to success as inventors. It is true that now and then some wonderful discovery has been stumbled on by accident. But almost every invention that has been of any genuine importance to the world has been the result of long and patient study and unwearying toil. No amount of guesswork will produce a new machine possessing the qualities of novelty and utility requisite to a successful invention. The man who would bring such a machine into existence must devote his days to the acquisition of a thorough knowledge of the philosophical principles underlying its construction. He will need to understand the laws of mechanics; he must be able to perform certain necessary mathematical processes; and he must have an insight into the theory of machinery. One inventor will probably find it necessary to study the laws of hydrostatics; another will need to have a complete knowledge of chemistry, or of mineralogy, or of botany; still another will add to all these branches of knowledge an understanding of the science of optics, or of acoustics, or it may be of meteorology, or of astronomy, or of navigation.

Knowledge *vs.* Guesswork

PATENTS.

Then, again, every inventor will find it worth while to learn what has been done by other inventors who have come before him. Turn to the chronological table on pages 625–60, Volume V, of the *Encyclopædia Britannica*, and notice the dates when the great inventions and discoveries which have revolutionized the world first made their appearance. Read next the History of Patents in XVIII, 359–63, and notice the patent laws which are now in force in all the principal countries, and particularly in the United States, XXVIII, 347.

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List of models in the U. S. Patent Office, XXVIII, 349.

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How to apply for a patent, XXVIII, 355.

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Trade-marks, XXIII, 530; XXVIII, 359.

Registration of prints, etc., XXVIII, 360.

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GREAT INVENTORS.

It will now be both profitable and interesting to read the biographies of the famous inventors of various times and countries. You might begin with the legendary story of Dædalus, the first great inventor, VI, 670; then take up subjects like the following:

Roger Bacon, the first English scientist and inventor, III, 188; his magical inventions, XV, 208; his theory of optical glasses, XXIII, 146.

Hans Lippershey, inventor of the telescope, X, 29 b″–30 a.

Galileo, inventor of the alcohol thermometer, XXIII, 308; X, 29 b.

Evangelista Torricelli, inventor of the barometer, XXIII, 481–82.

Otto von Guericke, inventor of the air-pump, XI, 218.

John Harrison, inventor of the chronometer, and of the gridiron pendulum, XI, 442.

John Dollond, inventor of the achromatic telescope, VII, 299.

Sir Humphry Davy, inventor of the safety-lamp, VI, 743; the Davy lamp, VI, 68.

Denis Papin, inventor of the heat-engine, XVIII, 232, and XXII, 492; his improvements on the air-pump, XIX, 258.

James Watt, inventor of the steam-engine, XXIV, 433.

John Fitch, IX, 236, and Robert Fulton, IX, 717 a‴; III, 468 (Henry Bell), inventors of the steamboat.

Oliver Evans, improver of the steam-engine, VIII, 637, and XXII, 494.

Benjamin Franklin, the first American scientist, IX, 626; his electrical researches, VIII, 7.

Eli Whitney, inventor of the cotton-gin, VI, 429; XXIX, 544.

Samuel F. B. Morse, XVI, 874, and Sir Charles Wheatstone, XXIV, 568, inventors of the electric telegraph. Wheatstone also invented the stereoscope, XXII, 565.

David Edward Hughes, inventor of the printing-telegraph, XXVII, 336.

Sir Richard Arkwright, inventor of the spinning-frame, II, 474; VI, 435.

James Hargreaves, inventor of the spinning-jenny, VI, 434; XVII, 614.

Joseph Nicéphore Niepce, XVII, 508; Louis J. M. Daguerre, VI, 671; and William Henry Fox Talbot, XXIII, 32, inventors of photography.

Scott Archer, inventor of the collodion process in photography, XXIII, 32 a″; XVIII, 837 b–38.

George Stephenson, improver of the locomotive, XXII, 564.

Sir David Brewster, inventor of the kaleidoscope, and of the dioptric apparatus for lighthouses, IV, 246–47.

Charles Goodyear, inventor of vulcanized india-rubber, XXVII, 125.

Robert Hare, inventor of the oxy-hydrogen blowpipe, XXVII, 231.

Samuel Crompton, inventor of the spinning-mule, VI, 528.

Samuel Colt, inventor of improved firearms, VI, 149.

Richard J. Gatling, inventor of the Gatling gun, XXVII, 70.

Henri de Girard, inventor of flax-spinning apparatus, X, 553.

Sir William Siemens, inventor of the gas-engine, XXII, 42, 553.

Elias Howe, inventor of the sewing-machine, XXI, 754; XXVII, 330.

Alvan Clark, telescope-maker, XXVI, 183.

Cyrus H. McCormick, inventor of the reaping-machine, XXVII, 659.

Thomas A. Edison, inventor of many electrical machines and appliances, XXVI, 488.

Alexander Graham Bell, inventor of the speaking-telephone, XXV, 415.

Isaac Babbitt, inventor of Babbitt metal, XXV, 314.

Sir Henry Bessemer, "Bessemer steel," XXV, 444.

John Ericsson, inventor of the Monitor, XXVI, 585.

Oliver Evans, inventor of the steam road-carriage, XXVI, 595.

M. W. Baldwin, inventor of locomotives, XXV, 332.

Thaddeus Fairbanks, inventor of platform scales, XXVI, 610.

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Printing-presses, XXVIII, 490; type-setting machines, XXIX, 343; XXIII, 745; typewriters, XXIX, 346; XXIV, 733.

Air-ships. See the article AERONAUTICS, I, 167, and particularly the supplementary article on the same subject, XXV, 55, which gives an account of the latest experiments and discoveries. Read of flying-machines in the article Flight, IX, 277–84; and of balloons in I, 169, and XIX, 598 a.

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This list might be continued to a very great length, but enough has been given to indicate the very complete and comprehensive manner in which the subject of inventions is treated in the *Britannica*.

SPECIAL SUBJECTS.

There are certain special subjects with which almost every inventor needs to have some acquaintance. One man will want to know all about the most recent discoveries in electricity; for he is seeking to invent some new electrical appliance, or to make some improvement on former patents. He should consult the references given in Chapter XXVI, entitled *The Electrician*, in this GUIDE.

Another inventor will find it necessary to investigate the phenomena and laws of HEAT. Here are some references that may be helpful to him:

Special article on Heat, XI, 495.

Theory of the action of heat, XIX, 6.

Heat

Heat as energy, VIII, 188.

Law of latent heat, VIII, 641.

Diffusion of heat, VII, 189.

Conduction of heat, XX, 219.

Convection of heat, XX, 219.

Power of heat in mechanics, XV, 783.

Production of heat by different fuels, IX, 708.

Heat of coal compared with that of oil, XVIII, 244.

Mechanical equivalent of heat, VIII, 189.

Transformation of heat into force, XXIII, 303.

A third inventor will want to understand the theory and construction of MACHINES, and perhaps also the general laws of mechanics. Let such a one consult the references given in Chapter XXIV, entitled *The Mechanic*, in this GUIDE.

Mechanical Laws

A fourth inventor is interested in such subjects as the air, gases, etc. He will find the *Britannica* full of information of just the sort that he is seeking. For example, in I, 379, there is a brief article on AIR, with references to

Atmosphere, III, 26.

Meteorology, XVI, 119.

Barometer, III, 329.

Pneumatics, XIX, 252.
Ventilation, XXIV, 171.

This is followed by an interesting account of the air-engine, I, 379; and this by an article describing the air-pump, I, 380. Then, by turning to the Index volume, one may find scores of minor references to various items of information relating to this particular subject.

In short, there is no subject connected with the invention of machines, or of useful appliances of any kind, that does not receive somewhere in the *Britannica* the concise and comprehensive treatment which its importance demands.

See the following chapters in this book: *The Engineer, The Architect, The Builder, The Manufacturer, The Railroad Man, The Farmer, The Printer, The Miner.*

CHAPTER XXVIII

The Architect

" . . . When we mean to build
We first survey the plot, then draw the model."
—*2 Henry IV.*

"If a man read little, he had need to have much cunning to seem to know that he doth not."—*Lord Bacon.*

The work of the architect is closely connected with that of the builder. The

Definitions

end of building, merely as such, is convenience or use, irrespective of appearance; but the end of architecture is so to arrange the plan, masses, and enrichments of a structure as to impart to it interest, beauty, grandeur, unity, power. Building is a trade; architecture is an art.

The *Encyclopædia Britannica* is a mine of valuable information for the architect. There is scarcely any question connected with the practical application of his art that does not receive notice and discussion somewhere within its pages. The history of archi-

Leading Article

tecture is treated with special fulness. The leading article on this subject (in Volume II, pp. 334–419) is a very complete treatise embracing as much matter as is contained in an ordinary 12mo book of four hundred pages. It is enriched with eighteen full-page plates, besides nearly one hundred illustrations. Following it is a Glossary of Architectural Terms (especially classical and mediæval), filling sixteen double-column pages. A supplementary article on American Architecture, XXV, 224, contains a number of designs and plans for modern dwelling-houses, with much other valuable matter.

The following are among the numerous subjects of interest which the architect will find fully described or explained in the *Britannica.*

Prehistoric structures, II, 335; ancient remains at Carnac, V, 104; XXI, 57 a′; Cromlechs, VI, 528; XXI, 57–58; ancient stone circle at Stonehenge, XXII, 604;

and at Avebury, III, 125; tumuli, III, 342; lake-dwellings, XIV, 223; crannogs, VI, 489; dolmens, XXI, 57.

Egyptian architecture, II, 336; pyramids, XX, 128; V, 505; sphinxes, VII, 670; the Serapeum, XXI, 706; labyrinth, VII, 671; tombs, VII, 677; XVI, 893; temples, VII, 673.

History of Architecture

Jewish architecture, II, 343; temple, of Solomon, XXIII, 182; of Zerubbabel, XXIII, 183; of Herod, XXIII, 184.

Indian architecture, II, 345; Taj Mahal, I, 256.

Assyrian architecture, II, 348.

Persian architecture, II, 350; Persepolis, XVIII, 569; Susa, XXII, 760.

Grecian architecture, II, 352; remains at Mycenæ, II, 303; XVII, 121; the Caryatides, II, 357; Choragic monuments, II, 360.

Three orders of Grecian architecture (Doric, Ionic, and Corinthian), II, 353; Doric, II, 358; Ionic, II, 366; Corinthian, II, 364; IV, 628.

Roman architecture, II, 362; the Pantheon, XX, 849; Colosseum, I, 680; dwellings of Pompeii, II, 368; XIX, 459.

Byzantine architecture, II, 369 b, XXIV, 160 b.

Pointed architecture, II, 369; Gothic architecture in England, II, 372; in France, II, 376; in Germany, II, 377; in Spain, II, 378; in Italy, II, 380.

Modern Italian architecture, II, 382; St. Peter's at Rome, II, 383; III, 358.

Modern English architecture, II, 387; St. Paul's Cathedral, XIV, 847; Inigo Jones, XIII, 748; Sir Christopher Wren, XXIV, 724; XVII, 453; Ely Cathedral, VIII, 144.

Saracenic architecture, II, 389; mosques of Bagdad, III, 200; of Constantinople, VI, 271; great mosque at Damascus, VI, 696; at Mecca, XV, 679; the Alhambra, I, 503.

Chinese architecture, II, 392.

American Architecture, XXV, 224.

Ancient American architecture, II, 394.

Present position of architecture, II, 396.

Architecture at the World's Columbian Exposition, XXIX, 595.

Richard M. Hunt, XXVII, 341.

Henry Hobson Richardson, XXVIII, 588.

Richardson and his work, XXV, 228.

Among the large number of special subjects relating to practice of this art, the following will be found both valuable and interesting:

Special Subjects

Abacus, I, 11.
Abbeys, I, 17.
Aisle, I, 382.
Almshouses, II, 403.
Apartment houses, XXV, 208.
Apse, II, 187.
Arcade, II, 285.
Arch, II, 286.
Architrave, II, 403.
Baluster, II, 403.
Baptistery, III, 304.
Basilica, III, 355.
Campanile, IV, 665.
Caryatides, II, 357.
Cathedral, V, 197.
Chantry, II, 405.
Cloister, VI, 35.
Column, II, 406.
Coping, IV, 414.
Cornice, II, 406.
Cupola, VII, 301.
Dome, VII, 301.
Dormer window, II, 407.
Entablature, II, 343.
Fresco, IX, 676.
Monastery, I, 17.
Mosaic, XVI, 876.
Moulding, IV, 435.
Parapet, II, 412; IX, 371.

ARCHITECTURAL ACHIEVEMENTS.

Famous Buildings

St. Peter's at Rome, II, 383.

St. Paul's in London, XIV, 847.

Cologne Cathedral, VI, 136; II, 377; XXI, 591 a.'''

Milan Cathedral, XVI, 302 b'''–303; II, 381.

Seville Cathedral, XXI, 742 a.'''

Cordova Cathedral, with its Hall of 1,000 columns, VI, 345 b''–346.

York Minster, II, 374; (Cathedral of St. Peter), XXIV, 787.

Cathedral of Geneva, X, 131.

The Egyptian Temples, II, 340.

The Parthenon, III, 6.

The Atrium, III, 44.

The Mausoleum, XV, 649 b'''; XI, 343.

The Colosseum, I, 679.

The Temple of Diana at Ephesus, VIII, 415–16.

The Temple of the Sun at Baalbec, III, 154.

The Temple of the Sun at Palmyra, XVIII, 203.

The Hindu temples, II, 347.

Jain temple, I, 375.

The Taj Mahal, I, 256.

The Grand Mosque and the Kaaba of Mecca, XV, 679.

The Alhambra, I, 503.

The Bastile, III, 371.

Lara Jongran, IV, 193.

Leaning Tower of Pisa, IV, 666.

Pyramid of Gizeh, XX, 130.

The Escorial, VIII, 477.

The Labyrinth, XIV, 180.

The Capitol at Washington, XXV, 225.

For additional references, see the following chapter, entitled *The Builder*.

BRIDGES, FORTIFICATIONS, ETC.

For references to articles concerning the construction of bridges, fortifications, etc., see Chapter XXX, entitled *The Engineer*, in this GUIDE.

CHAPTER XXIX

THE BUILDER

"In the elder days of art
Builders wrought with greatest care
Each minute and unseen part,
For the gods see everywhere."

— *Longfellow.*

THE art of building is in a certain sense supplementary to the art of architecture. In its highest application it may very properly be called *practical architecture*. Building, however, is frequently employed when the result is not architectural; and in such case it is the exercise of labor to the accomplishment of a certain useful end, and cannot properly be styled an art. The successful builder ought to possess a scientific knowledge of carpentry, joinery, masonry, and all other trades connected with building; and he should have a practical understanding of the fitness, strength, durability, and resistance of all kinds of materials. The *Encyclopædia Britannica* offers a vast amount of information on all these subjects; it is,

Practical Architecture

in fact, a library of useful knowledge for any person engaged in the building trades.

The special article on BUILDING, IV, 400–459, is in itself a complete treatise on this subject. Each of the various divisions of the builder's trade is considered separately.

MASON-WORK, IV, 418.

Brick, history and manufacture of, IV, 249; ancient bricks, XIX, 621, 638; enameled bricks, VIII, 169; glazed bricks in wall-linings, XVII, 41; brick as building material, IV, 401; strength of brick, XXIX, 171; XXII, 634; brick facings (Roman), XX, 827.

Mason-work

Bricks and brick-making, XXV, 587, describes the most improved processes now in use in the United States. It will be seen that the introduction of machinery has revolutionized the industry.

Use of brick in combination with stone, II, 400.

Use of steel in building, XXV, 229.

Brick architecture in Germany, II, 378.

Bricklaying, IV, 411.

Mortar, XIV, 654; how mortar is made, IV, 411.

Calcination of lime, XIII, 303.

Quicklime, XXI, 175.

Building-stone, IV, 401, 419, and XXV, 638; strength of, XXIX, 171; XXII, 634.

Granite, XI, 43; X, 205; sandstone, X, 212.

Limestone, X, 206.

Marble, XV, 535; marble veneer, XVII, 41.

Stone cutting and dressing, XXIX, 166.

Concrete, VI, 216, and IV, 405.

Plaster-work, IV, 451.

Cements, V, 285.

Portland cement, IV, 411.

Hydraulic cement, XIV, 654.

Stone-pavings, IV, 423.

Paving in bricks and tiles, IV, 417.

Paving-tiles, XXIII, 416.

Mason's tools, IV, 419.

Scaffolding, IV, 409, 419.

Chimneys and flues, IV, 417.

Ventilation by chimneys, XXIV, 172.

Chimney-pieces, IV, 423.

Sewers and drains, IV, 417.

CARPENTER-WORK, IV, 426.

Carpentry with the use of labor-saving machinery, XXVI, 70.

Carpenter's tools, IV, 426.

Flooring, IV, 404, 431, 441.

Partitions, IV, 433.

Timber, IV, 400; strength of, XXIX, 171; VII, 708; and XXII, 634; shrinkage, IV, 434.

Kinds of wood used for finishing, IV, 435 a.′′′

Carpenter-work

Mouldings, IV, 435.

Sawing, XXI, 358; XI, 391; sawyer-work, IV, 426.

Planing, XI, 391; XV, 155.

Hanging doors, IV, 439.

Windows, X, 594; IV, 441.

Ventilation by windows, XXIV, 173.

ROOFER'S WORK, IV, 433, and VII, 301.

Slate, XXII, 135; strength of, XXII, 634; slater's work, IV, 448.

Roofing

Shingles, XXI, 361, and II, 416.

Thatch, IV, 449.

Copper, zinc, and tin roofs, IV, 451.

PLUMBER'S WORK, IV, 449.

Sanitary conveniences of modern houses, XXVIII, 669.

Sanitary plumbing, XXVIII, 442.

Radiators for indoor heating, XXVIII, 530.

Lead, XIV, 374; solder, XXII, 262.

Lead-pipes and gutters, IV, 450.

Plumbing

Water-pipes, XII, 508; XXVIII, 443.

Cesspools, tanks, and water-closets, IV, 418.
House drainage, XXVIII, 443.
Gas-fitting, IV, 456.

PLASTERER'S WORK, IV, 451.

PAINTER'S AND DECORATOR'S WORK, IV, 457.

Plastering and Painting

Mural decoration, XVII, 40.
Stucco-work, XVII, 44, and IV, 454.
Paper-hangings, IV, 459.
Japanese paper-hangings, XIII, 602.
See also Pigments, XIX, 94.
Body-color, XXV, 514.

GLAZIER'S WORK, IV, 455.

Glazing

Glass, X, 576; window glass, X, 587; plate glass, X, 590.
Putty, XX, 124.
Lead-work, IV, 456.
Stained glass, X, 596.
Pavement lights, IV, 456.

Many other articles of practical value to the builder will be suggested to him from time to time, and can be found by reference to the Index volume of the *Britannica*.

The article on BUILDING ASSOCIATIONS, IV, 459, and especially that on BUILDING AND LOAN ASSOCIATIONS in the United States, XXV, 635–38, are full of practical information, not only for the builders, but for all owners and prospective owners of houses.

For a short list of famous buildings, see p. 119 of this GUIDE.

See also the chapters entitled *The Mechanic* (Chapter XXIV) and *The Engineer* (Chapter XXX).

CHAPTER XXX

THE ENGINEER

"Do as I have done—persevere."—*George Stephenson.*

ENGINEERING—the art of designing and constructing works—embraces a very wide range of subjects, and the different departments into which the profession is divided do not admit of very strict definition. In this chapter it is proposed to indicate a few of the subjects in the *Encyclopædia Britannica* which have relation to the work of the civil engineer. Among these subjects are the different branches of mathematics, which the GUIDE has already mentioned in the chapter on that subject. To these may be added the articles:

Surveying, XXII, 731, and
Geodesy, X, 146.

Surveying

Both of these, aside from the purely technical and mathematical portions of which they are largely composed, contain much matter of interest and practical value. See also STADIA MEASUREMENT, XXIX, 146. Of other articles there are many, but it is necessary here to name only a few as examples of the quality of instruction and information to be derived from the *Britannica*.

Bridges

Bridges, IV, 253–309, is a very comprehensive article, with numerous diagrams and illustrations. A supplementary article on the

same subject, XXV, 588, contains an alphabetical list of the principal bridges in the world, with descriptive notes on those which are of the most recent construction. Many of these famous bridges are described in separate articles, of which the following are examples:

Brooklyn Bridge, XVII, 478.
Forth Bridge, XX, 242.
St. Louis Bridge, XXI, 194.

Laws governing the erection of bridges, XXV, 592.
Caissons (used in bridge building), IV, 574.
River engineering, XX, 586.
River engineering on the Mississippi, XVI, 543; James B. Eads, XXVI, 477.
Engineering at Hell Gate, XXVII, 268.
Embankment, VIII, 146.
Cantilever, XXVI, 50, and XXV, 591 (Poughkeepsie Bridge).

Aqueducts, II, 191; chiefly interesting on account of the history which it contains of ancient aqueducts. The modern methods of constructing aqueducts and tunnels are fully described in XXV, 217. See also
Railway tunnels, XX, 241.
Tunneling, XXIII, 662.
St. Gotthard tunnel, XXIII, 664.
Sutro tunnel, XVII, 377; XXIX, 207.
Hoosac tunnel, XV, 620 a.'
Viaducts, XXIX, 436.

Waterworks, XXIV, 427, with chapters on reservoir dams, conveyance, purification, storage, and distribution.

Waterworks

Waterworks of London, XIV, 834.
Of Paris, XVIII, 285.
Of New York, XVII, 478.
Of Glasgow, X, 572.
Coffer-dams, VI, 104.

Canals, IV, 691–702, with diagrams and illustrations.

Canals

History of canals and canal construction, XXVI, 40–46.
Suez Canal, XXII, 653.
Panama Canal, XVIII, 213.
Nicaragua Canal, XXVIII, 243.
M. de Lesseps, XXVII, 580.

Harbors, XI, 406–16, with numerous diagrams. Supplementary article relating specially to the harbors and docks of the United States, XXVII, 225.

Harbors

United States Coast Survey, XXVI, 215.
Docks, XI, 416–22.

Roads, XX, 597; construction of roads, p. 597; stone pavements, p. 600; wood paving, p. 601; asphalt paving, p. 602.

Roads

Telford road, XXIII, 170.
Macadam, the Scotch road-maker, XX, 597–98.
James Nasmyth, XXVIII, 172.
Railways, see Chapter XL, entitled *The Railroad Man*, in this GUIDE.

Lighthouses, XIV, 620.
The Eddystone tower, p. 620.
Other famous lighthouses, p. 621; modes of construction, p. 622.

Light-houses

Beacons and buoys, p. 632.

Irrigation, XIII, 372; XXV, 99, and XXVII, 414.
Sewerage, construction of sewers, XXI, 745.
Sewerage of London, XIV, 835; of Paris, XVIII, 285.

Fortifications, IX, 371–413, a comprehensive treatise, illustrated with numerous diagrams and plates. Especially interesting, even to non-scientific readers, is the history of improvements in perma-

Fortifications

nent fortifications, pp. 388–90, and the chapter on the fortification of capitals, p. 412. So also is the account of the siege of the citadel of Antwerp, IX, 404, and of the defense of Dantzic, IX, 406.

Other valuable articles are such as the following:

Miscellaneous

Engineering Societies of the U. S., XXVI, 575.

Societies of Engineers, XXII, 238.

Amalgamated Society of Engineers, XXIII, 531.

Naval Engineers, duties of, XVII, 302.

Royal Engineers in the British army, II, 507.

Strength of materials, XXII, 623.

Eiffel tower, XXVI, 501.

Gunnery, XI, 263.

Artillery, II, 572.

Heliography, XI, 564.

Shipbuilding, XXI, 845.

See also the chapters entitled *The Builder* (Chapter XXIX), *The Seaman* (Chapter XXXIX), and *The Machinist* (Chapter XXV), in this Guide.

CHAPTER XXXI

The Laborer

"All true work is sacred; in all true work, were it but true hand-labor, there is something of divineness."— *Thomas Carlyle.*

"Whatsoever thy hand findeth to do, do it with thy might."— *Ecclesiastes.*

Nearly every chapter in this Guide is addressed to the laborer in one or other division of the world's industries. The man who works with his brain is no less a laborer than he who toils with his hands. Hence the teacher, the lawyer, the banker, are as truly laborers as the mechanic, the builder, the farmer, the worker on the roads, the employee of the mill or the factory. "The life of man in this world," says Samuel Smiles, "is for the most part a life of work. In the case of ordinary men, work may be regarded as their normal condition. Every man worth calling a man should be willing and able to work. The honest laboring man finds work necessary for his sustenance, but it is equally necessary for men of all conditions and in every relationship of life. . . . Labor is indeed the price set upon everything which is valuable. Nothing can be accomplished without it."

Who are Laborers?

In the present chapter it is the purpose of the Guide to point out some of the many articles and other passages in the *Encyclopædia Britannica* that may be of general interest to all classes of workingmen, especially to those who labor with their hands. The history of labor is identical with the history of civilization, for without the one the other could not exist. Workingmen of the present day may learn much that is both interesting and instructive by studying the conditions of labor in former times

History of Labor

and in other countries. The *Britannica* affords ample facilities for such study. See, for example, the following articles or parts of articles:

Labor in early times, I, 262; XIV, 166.
Slavery, XXII, 137.
Labor in England in the Middle Ages, XIV, 167.
Day-laborers in the time of Queen Elizabeth, XIV, 169.
Labor laws in Great Britain, XIV, 171.
The factory system, XXIX, 209.
Apprenticeship, II, 185; IX, 667.
Guilds, XI, 230; of London, XIV, 828.

The following articles will be found of greater or less interest to the different classes of workingmen everywhere:

Labor and Capital

Labor and Capital, XXIV, 54.
Labor and Wages, XXIV, 326.
Labor and Wealth, XXIV, 487.
Labor and Socialism, XXII, 217, 223.
Labor and Communism, VI, 193.
The Sweating System, XXIX, 208.

Capital, V, 64.
Capital and Socialism, XXII, 218, 224.
Theories concerning capital, XIX, 387.

Wages

Wages, XXIV, 326; XIV, 166.
Wages in the United States, XXIX, 464.
Payment of wages, XVIII, 451.
Lassalle's theory of wages, XIV, 321.
Marx's theory of wages, XXII, 224.
Enfranchisement of the working classes, XIX, 365.
Progress of the working classes, XXIV, 333.
Legal relations of workingmen and employers, XIV, 171; XXVI, 571.
Mechanics' Institutes, III, 676.
Industrial condition of women, XXVII, 384.

Labor Organizations

Trade guilds and wages, XXIV, 331.
Unions of workingmen, XXIII, 530.
American Workingmen's Organizations, XXVII, 526.
Trade Unions, XXIII, 530.

American Federation of Labor, XXV, 159.
Knights of Labor, XXVII, 526.
Ancient Order of United Workmen, XXV, 183.
Trade Unions in England, II, 186.
Workingmen's International Association, XIII, 195.

Strikes, XXIII, 531.
Recent great strikes in the United States, XXIX, 371.
Boycotting, XXV, 563.
Coöperation, VI, 300.
Mutual Benefit Societies in the United States, XXV, 424.
Mutual Benefit Orders, IX, 686.
Building and Loan Associations, XXV, 635.
Agricultural coöperation, I, 369.
Farmers' Organizations, XXVI, 618.
International Typographical Union, XXVII, 526.
American Railway Union, XXVII, 529; XXIX, 372.
Labor Parties in the United States, XXVII, 529.
United Mine-workers of America, XXIX, 371.
Coxey's "Commonweal Army," XXIX, 375.

CHAPTER XXXII

The Farmer

"Life in the country is full of practical teachings, which richer folk are apt sedulously to deny to their children."—*A Sussex Idyl.*

"Compare the state of that man, such as he would be without books, with what that man may be with books."—*Lord Houghton.*

A Common Illustration

Farmer A and Farmer B are neighbors. Their lands join, and each has the same number of acres. Twenty years ago, when they entered upon these lands, they seemed to be on an equal footing in every way. It would have puzzled an expert to tell which of the farms had the better soil, or which was the most favorably situated for the purposes of agriculture. Both men were industrious, although everybody said that Farmer B was the harder worker of the two. Yet, from the very start, Farmer A had always the better success. His crops were better, the products of his farm were of a finer quality, he had fewer losses and fewer expenses, and, in short, everything prospered with him. But Farmer B, in spite of all his industry, fell constantly behind. His lands became less and less fertile every year. His crops failed, his stock died, every enterprise seemed to end in disappointment or disaster.

The Educated Farmer

How can we account for the difference in the fortunes of these two men? We cannot explain it by saying that one was born to good luck, and the other to misfortune. It is to be explained in this way: Farmer A spared no pains to acquire a thorough knowledge of his calling. He was a reader of books, and through them he availed himself of the experience of others in every department of agriculture. On the other hand, Farmer B placed his entire dependence upon industry alone; and in the conduct of his business he had only his own narrow experience to guide him.

The day of guesswork in farming has passed. In every detail of the farmer's calling knowledge counts for gain. Other things being equal, the land-worker who keeps abreast of the times has an immense advantage over him who is content to plod along in the footsteps of his ancestors.

To the progressive farmer, the *Encyclopædia Britannica* is a mine of useful knowledge. Containing information of the most thorough and trustworthy kind concerning every department of his business, it proves itself to be a ready helper and adviser on all occasions.

The article on Agriculture in the United States, XXV, 89–101, is the work of Hon. J. Sterling Morton, ex-Secretary of the Department of Agriculture, and of Charles W. Dabney, Jr., both of whom rank among the highest living authorities on this subject. It is an article of great practical value, giving just that kind of information which every intelligent farmer in this country wishes to have. The historical portion is particularly interesting; while the statistics relative to United States farms present many facts that are worth knowing. The sections on Farm Products, Crops, Fibers, Tobacco, Truck-Farms, Market-

Gardens, Sugar, Orchard Products, Vineyards, and Minor Crops, pp. 91–96, contain much material for thought, and are full of good suggestions.

Farming in General

The general article on AGRICULTURE, I, 259–370, is a comprehensive treatise, covering 112 pages, in which every farmer will find much that is both interesting and profitable. Although it may be said to present the subject from an English point of view, it is nevertheless replete with that sort of information which farmers everywhere appreciate. To the curious farmer, who would like to know how the work of his craft was done in olden times, the chapter on Ancient Husbandry, I, 259–64, will be full of interest. The relative advantages of "Small Farming" and "Large Farming" are discussed in I, 364, and XIV, 268. Truck-farming in the United States is described in XXV, 94; and this introduces us to a highly interesting article on LAND, its ownership, distribution, etc., XIV, 260–71.

Landowning

An article on HOMESTEADS, XII, 125, contains complete information concerning the Homestead Law in the United States, and the preëmption of claims on Government lands, XII, 126 a." Still later facts relating to the same subject are given in the article on PUBLIC LANDS OF THE UNITED STATES, XXVIII, 514. The section on the SURVEYS OF PUBLIC LANDS in the United States, XXIX, 366, presents much valuable information. The farm-seeker who finds it necessary to lease instead of buying or otherwise becoming the owner of his farm will obtain many practical hints from the article on LANDLORD AND TENANT, XIV, 273–78. He will be interested, too, in reading the chapter on Tenure of Land, I, 361, and the article on Rent, XX, 414. The landowner will also find many things of interest in these articles, and he will want to read still more of the history of landownership in AGRARIAN LAWS, I, 256 a."

Buildings

The chapter on Farm Buildings, I, 274, will save many a farmer much more than the cost of an *Encyclopædia;* that on Fences, I, 275, is also full of valuable suggestions. Not many farmers have to build bridges, but such as do will find something of interest to them in XXV, 588. The building of fruit-houses is described in XII, 227 a‴, and of plant-houses in XII, 225 a.‴

Machines, Implements, and Tools

Next to the subject of buildings, that of machines, implements, and tools is of importance to every farmer. These are described in detail and at length in the chapter on Machines and Implements of Husbandry, I, 276–92. See also

Harvesting Machinery, XXVII, 243.

Corn-harvesters, XXVII, 247.

American plows, XXVIII, 442.

American threshing-machinery, XXIX, 279.

Improved straw-stacker, XXIX, 281.

Soils

The successful farmer must also know something about soils. He will find this subject treated in a general way in I, 273; the chemistry of soils is noticed in XIV, 570 a′; the soils best suited for gardens are described in XII, 221, 237; while the manner in which different kinds of soils were originally produced is described briefly in X, 236.

Fertilizers

Closely connected with the latter subject is that of fertilizers. Read what is said of Fertilizers, I, 286; of Manures, I, 308, and XII, 238; of the value of Bone Manure, I, 310; of Lime, I, 312; and of Artificial Manures,

I, 314. Then turn to the special and very valuable article on MANURES, XV, 513–19, and to that on GUANO, XI, 206.

Irrigation

In some parts of the country irrigation is necessary to the production of crops. Farmers in such sections will find it profitable to read the general article on IRRIGATION, XIII, 372, and perhaps also that which is said about irrigation by sewage, XXI, 746. The latest facts regarding irrigation in the United States are given in XXV, 99, and XXVII, 414. It will also be interesting to read about the curious methods of irrigation practiced in other countries. For instance, the methods pursued in Egypt, VII, 613; in Arabia, II, 212 b′; in India, XII, 792; and in Spain, XXII, 313.

Crops

After soils, and the preparation of the ground for crops (see I, 292–303), we come to the crops themselves. The supplementary article on Wheat in America, XXIX, 534, is particularly valuable. A long and valuable article on WHEAT, XXIV, 560, is also worthy of every farmer's attention. Indian corn is described under the head of MAIZE, XV, 311. An interesting history of the potato is given in the general article POTATO, XIX, 611; while specific directions as to its culture are to be found in XII, 298 b. The diseases of the potato are described in XIX, 613; while the history and nature of the potato-bug are given in VI, 121 b. Passing now to other grains and vegetables, you will find each treated in its appropriate place; for example: Barley, III, 324, and XXV, 362; Oats, XVII, 715; Flax, IX, 256; XXV, 93, 94; Hemp, XI, 577; XXV, 94.

The special article on COTTON, VI, 427, is interesting and exhaustive. The sections on Cotton in the United States, XXV, 93; XXIX, 364, present the very latest statistics concerning this industry. For further information concerning the growth of cotton in the United States, see X, 391, and XXIII, 880. See also the reference to textile fabrics in this GUIDE, in Chapter XXIII, entitled *The Manufacturer*.

Growers of rice will turn to XX, 553; and they will also find pleasure in reading how this grain is cultivated in various countries — in India, III, 214, 490; in Japan, XIII, 583; in Java, XIII, 613; and in Madagascar, XV, 172.

The culture of tobacco in the United States receives due attention in XXV, 94, in XIV, 45; and in XXIV, 279.

Interesting facts concerning the history and nature of the plant are given in the general article on TOBACCO, XXIII, 451.

Other farm products are the subjects of valuable articles.

Broom-corn, XXV, 609.

Buckwheat, XXV, 631.

Statistics

The farmer who cares for statistics relative to the production of FARM PRODUCTS will find a great deal of trustworthy information in the article on AGRICULTURE, XXV, 89, as well as in the chapter on Agriculture in the United States, XXIII, 878–82.

Insects

Has the farmer any enemies? Yes, many of them; and the successful agriculturist will arm himself against them by becoming acquainted with their character and habits. The article on INSECTICIDE, XXVII, 391–92, will be found to be of great practical value. So also will the articles on the ARMY WORM, XXV, 247; on the WEEVIL, XXIV, 504; on the Insects, etc., injurious to Wheat, XXIV, 564–566; and on the various practical

recipes for insecticides, XXVII, 391. If you would recognize a friend, read also what is said of the Ichneumon Fly, XII, 665. It might be well too, to read about the Trichina, XXIV, 223; about Rusts, XXVIII, 635; and about Smuts, XXIX, 111. Vine-growers will find several matters of practical interest in the section relating to the diseases of the vine, XXIV, 256.

Miscellaneous

Various other topics claim the attention of the successful farmer. If he is interested in the production of hay, he will want to read the articles on Grasses, XI, 48, and XXVI, 678. If he cares for honey, he will see what is said about Bees, III, 417, 426; XII, 610; XIII, 147; about apiarian products, XXV, 99; about Honey, XII, 138–142; about Wax, XXIV, 485; and about the Bee Industry, XXV, 405–6. If he has more apples than he can eat or sell, he will learn all about Cider, V, 677; if he owns chickens or ducks or geese, he will want to know how to make them profitable. and will read the article on Poultry, XIX, 664. In fact, the number of subjects of this kind is so large that it is impossible here to enumerate them.

Further References

And now, Mr. Farmer, are you a gardener or a fruit-grower? Turn to the next two chapters in this book, and notice the references which are given there. You may not be a stock-raiser, in the strict meaning of the word; but we know that you want to have the best breeds of horses and cattle and swine, and in the care of them to avail yourself of the knowledge and experience of others. And so we refer you to Chapter XXXVI, entitled *The Stock-Raiser and Dairyman*, in this Guide. In that chapter you will also find numerous references to articles relating to milk, butter, cheese, etc., and the most approved and profitable methods of conducting a dairy.

Farming in Other Countries

Are you interested in what farmers are doing in other countries? Do you want to know what kinds of soil they have, what grains they raise, what implements they use? Do you care to learn about their modes of living, or about the profits which they derive from their labor? You will find just such information in the *Britannica*. Look under the head of the country which you have in mind. For example, you will find

Agriculture in Austria, III, 103.

Agriculture in Afghanistan, I, 209.

Agriculture in Arabia, II, 212.

And so with almost every country in the world.

Are you interested in the present trend of American agriculture? Of course you are. See what ex-Secretary Morton says on that subject in XXV, 100. Read also the brief account which follows on p. 101, of the Department of Agriculture at Washington.

Coöperation

Are you interested in coöperation with others of your calling? Read what is said about Farmers' Organizations, XXVI, 618; about agricultural coöperation, I, 369; about coöperation in general, VI, 300; and about communities in Europe and America, VI, 194–95. See also the article on World's Fairs, XXIX, 594.

The Education of Farmers

Nearly all enlightened nations recognize the importance of scientific instruction in the practice of agriculture. In Europe there were several agricultural colleges nearly a hundred years ago. In Germany scores of institutions are in successful operation wherein the

sons of farmers are instructed in the best methods of cultivating the soil. There are also many such schools in Belgium, France, and England, and the result is that the lands in those countries produce almost double the amount per acre raised before their establishment. In the United States, where less attention has been paid to this branch of education, the annual crops almost everywhere are less per acre. It was not until 1862 that the first national movement was made towards the establishment of Agricultural Colleges. An article in the XXV, 86, gives a complete history and description of the farmers' colleges now in operation in this country. Closely connected with these colleges are the agricultural experiment stations, of which one or more have been established in every state. These stations are intended to promote, under Government auspices, the methodical study of farmers' problems, and they are very fully described in XXV, 87–89. The relations of the Government and its agricultural stations to the farmer are very aptly stated in XXV, 100. The section on the Education of Farmers, I, 408, is well worth reading in this connection, presenting as it does some valuable thoughts from an English point of view. As to the manner in which many American farmers try to keep abreast of the times, see Farmers' Institutes, XXVI, 618.

Here, then, we have indicated enough reading to occupy your leisure moments for many a day. And as you pursue the study of these subjects, other topics will naturally fall under your eye, and you will see how inexhaustible is the fund of knowledge before you. Can anyone now say that the farmer who has made this knowledge his own will not be vastly more successful in all the departments of his calling than his neighbor whose information is limited to that which he has acquired through personal experience alone? The *Encyclopædia Britannica* is a farmer's library in itself, covering every division of agricultural lore; and its articles, being the work of specialists, are not only complete and comprehensive, but in the highest degree trustworthy and authoritative.

Conclusion

See also Chapter XXXV in this GUIDE, entitled *The Woodsman.*

CHAPTER XXXIII

THE GARDENER

"He that lives in his own fields and the habitation which God hath given him enjoys true peace. Nothing should hinder him from the pleasure of books."—*Antonio de Guevara*, 1540.

As A matter of course the gardener's interests are, to a large extent, identical with those of the farmer. Every successful gardener must know a good deal about soils, fertilizers, the preparation of the ground, farm implements and machinery, and many other subjects connected with that larger branch of agriculture generally called farming. And so, Mr. Gardener, if you have come to that storehouse of knowledge, the *Encyclopædia Britannica* for information

which will help you in the practice of your calling, we would advise you to turn to some of the articles which we have just named in the chapter for the guidance of the farmer. When you have obtained such information as you wish upon the subjects therein mentioned, you will be all the more ready to profit by the courses of reading and reference which follow.

Gardening in General

The general article on HORTICULTURE, XII, 215–302, will of course claim your first attention. This is a very comprehensive chapter, and contains as much matter as an ordinary 12mo volume of 350 pages. Some portions of the article may be of greater value to you than others. Turn to the Index on page 308, and see what the article contains that is of special interest to you.

The chapter on the Formation and Preparation of the Garden, XII, 221, contains some valuable practical hints. That on Garden Materials and Appliances (including Manures and Tools and Implements), XII, 237–40; that on Plant Houses, XII, 225–27; that on Fruit Houses, XII, 227–30; and that on Propagation, XII, 240–45, will also be found rich in suggestiveness and in direct information.

The Flower Garden

Is yours a flower garden? Read the chapter on the Flowers, XII, 253–78; and the chapter on Pruning, XII, 247–53. The article on FLORICULTURE, XXVI, 663–64, contains a number of interesting statistics concerning the progress of this industry in the United States, and will be read with profit by every florist.

The following articles and parts of articles are worthy of the attention of every gardener and of every lover of flowers.

History of the first attempts at the classification of plants, IV, 70 a.″

The story of Linnaeus, XIV, 677, and his classification of plants, IV, 70 b.′

The account of Robert Brown, the originator of the natural system of classification, IV, 71 b″, and IV, 347 a.

The chapter on Structural Elements of Plants, IV, 73.

The special article on the ROSE, XX, 873.

Then there are innumerable special articles on the different kinds of flowers, all of which may be found by reference to the Index volume. Among these articles it may not be amiss to call attention to the following:

Lily, XIV, 649.
Fuchsia, IX, 707.
Gladiolus, X, 564.
Geranium and Pelargonium, X, 395.
Convolvulus, XXVI, 273.
Dahlia, VI, 673.
Nasturtium, XVII, 245.
Orchids, XVII, 839.
Pansy, XVIII, 218.
Phlox, XVIII, 811.
Honeysuckle, XII, 143.
Hollyhock, XII, 106.
Hyacinth, XII, 435.
Mignonette, XVI, 301.
Rhododendron, XX, 541–42.
Tulip, XXIII, 643.

But it is unnecessary to name more. These are mentioned only as examples of many articles which lovers of flowers will take pleasure in finding and reading.

Wild Flowers

There are articles on wild flowers, too, such as Goldenrod, XXVII, 119; Ranunculus (buttercup), XX, 284; Violet, XXIV, 259; Daisy, VI, 681; Lily of the Valley, XXVII, 599–600; Dandelion, VI, 706; and scores of others. And in the general article on BOTANY, IV, 70, their structure, hab-

its, and growth are treated and described from a scientific standpoint.

If you are interested in Landscape-Gardening, see the article on that subject in XXVII, 541–42; also the article on LAWNS, XII, 254, and the articles on NATIONAL PARKS, NATIONAL MILITARY PARKS, and NATURAL PARKS, XXVIII, 334, 335, and the cross-references there given. See also William Kent, XIV, 42; and Andrew Jackson Downing, XXVI, 444.

Landscape Gardening

Some curious historical facts in relation to the subject may be found by reference to the article LABYRINTH, XIV, 180. The article ARBORICULTURE, II, 275, will also supply some useful hints; and the account of the Royal Botanical Gardens at Kew, XII, 156, and XXVII, 492, will be found interesting.

The VEGETABLE GARDEN is described in XII, 289; and the different kinds of vegetables profitable for cultivation are noticed, each in its appropriate place. Market gardening in the United States is the subject of a comprehensive paragraph in XXV, 95. See what is said about the Potato, XIX, 611, and I, 323, about its diseases, XIX, 613, and about its most destructive enemy, VI, 121.

The Vegetable Garden

The manner of raising other root crops, such as turnips, mangel-wurzels, carrots, parsnips, cabbages, kohlrabi, etc., is described with some minuteness in the chapter beginning on I, 323. All the common vegetables raised in the gardens receive notice in the *Britannica*. Special articles also are given on the cultivation of these vegetables in the United States, as:

BEET, XXV, 409; BEET SUGAR, XXV, 410, etc.

But for the latest information, see the special article on AGRICULTURE IN THE UNITED STATES, XXV, 89–101.

Market-Gardens, XXV, 95.

Minor Crops, XXV, 96.

Truck-farming in the United States, XXIX, 325.

Truck farms, XXV, 94.

See also the references in Chapters XXXIV and XXXV, entitled *The Fruit-Grower* and *The Woodsman*.

CHAPTER XXXIV

THE FRUIT-GROWER

"They shall sit every man under his vine and under his fig tree."
—*Micah.*

"You only, O books, are liberal and independent. You give to all who ask, and enfranchise all who serve you assiduously. Truly, you are the ears filled with most palatable grains—fruitful olives, vines of Engaddi, fig-trees knowing no sterility; burning lamps to be ever held in the hand."—*Richard de Bury.*

FOR the fruit-grower, be he farmer or gardener, there is to be found in the *Britannica* a great variety of practical, useful information. As to soils, fertilizers, irrigation, and other subjects of general interest to all cultivators of the ground, it may be well to consult the references already given in Chapter XXXII, for *The Farmer*. In the first volume of the *Britannica*, page 341, there is a short chapter on Orchard Culture which will

The Orchard

repay the reading. Of still greater practical interest is a chapter in XXV, 95, on Orchard Products of the United States. An extensive list of standard Fruit Trees, with descriptions of the best varieties, may be found in XII, 278, and should be marked for ready reference. Further descriptions of fruit and fruit trees are presented in special short articles under appropriate headings, for example:

Apple, II, 184; the culture of apples for cider, V, 677.

Apricot, II, 186.

Peach, XVIII, 453; the peach-house, XII, 228; peaches in the United States, XXVIII, 368.

Pear, XVIII, 456; XXVIII, 368.

Cherry, XII, 280, and V, 509.

Plum, XIX, 242.

Prune, XIX, 242.

Quince, XX, 188.

The article on Strawberry, XXII, 621, XII, 287 a‴, is interesting and valuable.

Small Fruits

So also are those on other small fruits:

Raspberry, XII, 286.

Cranberry, VI, 483, and XII, 280.

Whortleberry, XXIV, 587.

Huckleberry, XXVII, 333–34.

Bilberry, XXV, 473.

Blueberry, XXV, 510.

Currants, VI, 631, and XII, 280.

Gooseberry, X, 693.

The culture of grapes receives the attention which its importance deserves.

Grapes

See the practical chapters on Vineyards, XII, 287, and that on Vineyards in the United States, XXV, 96. See, too, Viticulture, XXIX, 454; also the special article on the Vine, XXIV, 254. The manufacture of wine from grapes is described fully in XXIV, 634.

The wines of different localities are referred to elsewhere, as:

Canary wine, IV, 703.

Catawba, V, 191. Maderia, XV, 179.

Tokay, XXIII, 460.

Würtemberg, XXIV, 736 b.

Fruit-houses, for the storing of the products of garden and orchard, are described at length in XII, 232.

Fruit Houses

The entire article on Horticulture, XII, 215–308, is of value to the fruit-grower, and should be read and frequently consulted.

See also the account of the societies that have been formed for the promotion of horticulture, XXII, 237.

Tropical fruits are noticed, and described at length.

Tropical Fruits

Some of the best known are:

The date-palm, VI, 731.

The fig-tree, IX, 135; IV, 109.

Banana, III, 265.

Olive, XVII, 783; III, 52.

Bread-fruit, IV, 216.

Lemon, XIV, 437.

Orange, XVII, 834.

Pine-apple, XIX, 114.

Pomegranate, XIX, 456.

Other articles which commend themselves not only to fruit-growers, but also to large numbers of gardeners and farmers, are the following:

Care of Trees

Grafting, XII, 217, 241.

Budding, XII, 242; XX, 435.

Pruning, XII, 218, 247.

Garden Trees, XII, 268.

Fungicides, XXVII, 47–48.

Mildew, XVI, 306.

Diseases of Vines, XXIV, 256.

The Canning Industry, XXVI, 48.

In Chapter XXXV, entitled *The Woodsmen*, in this Guide, the fruit-grower can find references to many other articles on trees, their culture, propagation, and uses. Many of these articles, if he will take the pains to consult them, may prove to be of genuine value to him.

CHAPTER XXXV

The Woodsman

"Love of trees and plants is safe. You do not run risks in your affections."—*Alexander Smith.*

"The love of knowledge comes with reading, and grows upon it."
—*Henry Ward Beecher.*

In this chapter the word woodsman will be used in a broad and somewhat unusual sense. It will include everyone who is in any way actively interested in trees, especially the trees of the forest: First, the man who regards trees only as objects of trade and profit, and views them always from an economical standpoint, caring for them only so far as they are of practical use to mankind; second, those who love trees for their beauty, their fragrance, their grateful shade, their friendship; and third, those who take pleasure in studying them in their scientific aspects, observing their modes of growth and their influence upon climate, soil, and various forms of vegetable and animal life. For all these "woodsmen" the *Encyclopædia Britannica* has a variety of useful, entertaining, and trustworthy information.

As an introduction to the study of trees, read the article on Forestry, XXVII, 5. Then turn to the very comprehensive article, Forests, Forest Administration, IX, 349–361, and notice the practical character of the information there given. After this, read of the Forests of the United States, XXIII, 863–66. Another article of much value is that on Arboriculture, II, 275–84. This, of course, relates especially to the growing of trees as one branch of agriculture. Read particularly the section relating to the culture of trees, II, 276, and that on timber trees, IX, 356–58. Valuable practical suggestions are also given with relation to plantations of forest trees, II, 282 a. For an account of the timbered region of the United States, see XXVIII, 430; IV, 623; XXIII, 864–65. For the forests of Canada, see IV, 683. The climatic influences of forests are discussed in VI, 5.

Of special interest to lumbermen is the article on Sawmills, XXI, 359. An account of the lumber trade in the United States is given in XXIII, 864. The trade in Michigan receives notice in XVI, 247, and that of Canada, in IV, 683. The uses of wood as building material are described in IV, 400; its strength, VII, 708, and XXII, 634; its value as fuel, IX, 709.

Lumbering

II. Useful Trees.

It is, of course, impossible in this chapter to name all the articles in the *Britannica* that have reference to individual forest trees. It may not be amiss, however, to direct special attention to the following:

Oak, XVII, 708—an illustrated article very interesting to all lovers of trees; the strength of oak wood, XXII, 634; the use of oak bark for tanning, XIV, 381; the oak in the United States, XXIII, 864–65.

Timber Trees

Elm, VIII, 140 b"; culture of, II, 278.

Pine, XIX, 110; strength of wood, XXII, 634; pines of California, IV, 623;

pines of the Alps, XIX, 110; culture of, II, 277.

Pine lumbering in the United States, XXVIII, 430.

Fir, IX, 193; strength of wood, XXII, 634; Scotch pines, XIX, 112.

Boxwood, IV, 164; uses of wood, XXIV, 679.

Rosewood, XX, 874.

Logwood, XIV, 814; XII, 137.

Mahogany, XV, 290; IX, 357; strength of wood, XXII, 634.

Eucalyptus, VIII, 570; XIII, 604; eucalyptus in Australia, XXIV, 234, 536.

The great trees of California are described in IV, 623, and XXI, 705.

Of the trees that are valuable for their products, but not valuable as timber, it may be interesting to note the following:

Valuable Trees

Cinchona (quinine tree), V, 682; its cultivation in Peru, XVIII, 687; in India, III, 490, and XII, 789; and in the Himalaya Mountains, XI, 733.

Caoutchouc (india-rubber), IX, 135; XVIII, 687; IV, 78 a‴, 203 b″; XII, 875.

Gutta Percha, IV, 78 a‴; XI, 301.

Cork (*Quercus suber*), VI, 356.

Gall-nuts (*Quercus infectoria*), X, 41.

III. FRUIT TREES.

Olive, XVII, 783; III, 52.

Orange, XVII, 834.

Lemon, XIV, 437.

Banana, III, 265; XIX, 186; and XIX, 433.

Mulberry, XVII, 19, and XXII, 63.

But for the common fruit trees, see Chapter XXXIII, entitled *The Gardener*.

IV. FOOD PLANTS AND TREES.

Coffee Plant, cultivation of, VI, 100; in Brazil, IV, 204 a′; in Cuba, VI, 602; in Arabia, II, 207; in Java, XIII, 614; in Ceylon, V, 320; in Venezuela, XXIV, 151 b′; in British Central Africa (Nyassaland), XXV, 82.

Tea Plant, XXIII, 104, and IV, 652; cultivation of, in China, V, 552; in India, XII, 788, and III, 490; in Ceylon, V, 320 b″; XXVI, 101–02.

Cocoa, or Cacao, VI, 92.

Cocoa-nut Palm, VI, 94.

Date Palm, VI, 731; XVIII, 195; of Arabia, II, 207.

Fig, IX, 135.

Almond, I, 523.

Aloe, I, 525.

Bread-fruit, IV, 216.

Among the curious trees of the world, mention may be made of the Banyan, III, 300; Baobab, I, 240; Bo, or sacred fig-tree, IX, 135; Upas tree, XXIII, 916; and this list might be extended indefinitely.

See also Chapter XXXIII, entitled *The Gardener*.

An account of the great parks of the world appeals to the interest of every woodsman and every lover of trees. See the following articles:

Parks

National Parks, XXVIII, 334.

Parks of the Rocky Mountains, XXVIII, 335; VI, 145; XXIII, 845.

Adirondack Park, XXV, 48.

National Military Parks, XXVIII, 335.

Yellowstone National Park, XXIX, 618.

Washington Elm, at Cambridge, XXVI, 24.

Charter Oak, XXVI, 120.

In conclusion, the reader's attention is directed to the article on Arbor Day, XXV, 221, and to the paragraph on the same subject, XXVII, 302.

The above references are sufficient to indicate the vast amount of curious, interesting, and instructive information that may be derived from the *Britannica* with reference to this subject of trees.

CHAPTER XXXVI

The Stock-Raiser and Dairyman

"The cattle are grazing,
Their heads never raising;
There are forty feeding like one."
— *Wordsworth.*

"The man who has studied a subject is on that subject the intellectual superior of the man who has not."—*Earl Lytton.*

The interests of the stock-raiser are in many respects identical with those of the farmer. Indeed, most farmers are stock-raisers, and most stock-raisers are by necessity also farmers. Hence, the references and readings indicated in this chapter are intended for the help and guidance both of farmers and stock-raisers, and of all readers of the *Britannica* who are in any way engaged in the breeding or care of domestic animals.

The chapter on stock-raising in the United States, XXV, 96, gives much valuable information that is strictly up to date. So also does the paragraph on farm animals in the United States, XXIX, 365.

Read the article Breeds and Breeding, IV, 219; then see what is said of the breeding of animals, I, 345, 349, and XXI, 758.

The article on the Horse, XII, 176, is a comprehensive one, of great value to every horse-owner. This is supplemented by some later facts in the article on Agriculture in the United States, XXV, 89–101, and by further information regarding the breeding and rearing of horses, I, 341.

The Horse

An interesting article on Horse-Racing in the United States may be found in XXVII, 322–24. After this, see Trotting and Pacing, XXIX, 322.

For the Arabian horse, see II, 209 b.'''

For the Persian, XVIII, 635.

For the Clydesdale, XIV, 252.

Trotting records, XXIX, 322.

Famous trotters and pacers, XXIX, 323.

For the diseases of horses, see XXIV, 217, 220.

The art of horse-shoeing is described in XXI, 870, and XVII, 172.

A special article on Cattle, V, 213, is interesting for its historical information.

Cattle

The chapter on Bovidæ, XV, 438, has a strictly scientific value. The breeding of cattle is discussed in I, 343. For the diseases of cattle, see XXV, 97; XVII, 63; XXIV, 220; I, 271; and V, 512. See also Fardelbound, XXVI, 617; Foot-rot, XXVI, 677; Founder, XXVII, 16.

The dairyman will read of the management of milch cows, I, 346. He will be specially interested in the long article on the Dairy, VI, 677; in the chapter on Dairy Products in the United States, XXV, 98; in the article on Milk, XVI, 314; Beestings, XXV, 409; Butter, IV, 525; and Cheese, V, 394. He will also read what is said of the freshness and purity of milk, and the directions for its treatment in the dairy, XVI, 316. Within recent years the methods of making butter have undergone radical changes, and these methods are described in XXV, 663.

See also Artificial Butter, XXV, 664.

American process of making cheese, XXVI, 126.

The influence of cattle-shows, I, 346, is another subject which will claim the cattle-breeder's attention.

One of the chief objects of the stock-raiser is to provide beeves, hogs, or sheep for the great markets, where they are slaughtered and turned into food products. This latter process does not necessarily interest the stock-raiser; it concerns rather the butcher and the dealer in dressed meats, and to these it may be a matter of moment to learn how every portion of a slaughtered animal may be made to realize some profit. The latest improved methods of slaughtering beeves and preparing the various parts for market are fully described in an article on the Economical System of Abattoirs, XXV, 11. A further and more complete account of the processes connected with the manufacture of flesh-food products is given in the article Packing, XXVIII, 314.

The Butcher

The article on Sheep, XXI, 820, is one of much value to all who have the care of these animals. The breeding and management of sheep are further discussed in I, 347, and IV, 224. The question as to what are the best foods in wool-culture is discussed in XXIX, 588.

Sheep

For Southdowns, see XXII, 762 b."

For Merinos, XXII, 315 a."

For Dorsets, VII, 321.

The diseases of sheep are described in XXIV, 221, and XXIII, 573; Murrain, XVII, 63.

The proper method of shearing is described in I, 351.

And in this connection the article on Wool, XXIV, 687, should be read, together with the supplementary article on Woolen Manufactures in the United States, XXIX, 587, and the section on Sheep and Wool, XXV, 98.

The American wool-grower will also be interested in what is said of wool-growing in Australia, III, 99 b.'" See also the references to Textile Products in Chapter XXIII, entitled *The Manufacturer*, in this Guide.

Hogs are treated historically and scientifically in the article on Swine, XXII, 810; and notes concerning their breeding and management are given in I, 355.

Hogs

For the history of hog-raising in the United States during the past ten years, see the section on that subject, XXV, 97–98.

Their diseases are described in XXIV, 221–23, and XVIII, 275.

Poultry is the subject of a valuable article, XIX, 664, wherein the various breeds of fowls are described at length. This may be supplemented by the article on Fowl, IX, 433. The management of poultry receives special attention in I, 356.

Poultry

Some interesting facts about eggs are given in VII, 175 b, 603–04; and the latest figures about their production, in XXV, 99. See also III, 669–72.

The Goose is noticed in a special article, X, 691; and the Duck in VII, 436; while the Turkey is described at length in XXIII, 699.

The question of foods and feeding is one in which the stock-raiser and the farmer are always interested.

The subject of pastures and pasturage is intelligently discussed in I, 329, 356, and is worthy of the careful attention of every stock-raiser. See also XIII, 378.

Pasturage

Some account of American grass crops for pasturage is given in XI, 48–53; and the cultivation of American grasses is the subject of an article in XXVI, 678.

The latest facts relating to the production of forage crops in this country are given in XXV, 94; XXVI, 678.

For the culture of HAY, see I, 336.

The various grains, vegetables, etc., used in feeding domestic animals have already been referred to in Chapter XXXII, entitled *The Farmer*.

Other domestic animals, not mentioned in this chapter, are treated of, each in its proper place. But the care of them cannot properly be said to belong exclusively to the stock-raiser or the farmer. (See the Index volume.)

CHAPTER XXXVII

THE MINER

"Excellence is never granted to man but as the reward of labor."
—*Sir Joshua Reynolds.*

MINING, or the process by which useful minerals are obtained from the earth's crust, is treated with great fulness in the *Britannica*. The special article on this subject, XVI, 459–94, is a valuable treatise, amply illustrated with cuts and diagrams, and full of interesting information for all who are engaged in this branch of industry. It may be read by sections, in connection with collateral references to other articles relating to the different branches of the subject.

Mining

1. Manner in which the useful minerals occur in the earth's crust, *viz.*, tabular deposits and masses, faults, or dislocations, XVI, 459–62.

2. Prospecting, or search for minerals, XVI, 462–63.

3. Boring with rods and ropes — diamond drills, XVI, 462–64; Quarrying Machinery, XXVIII, 523.

4. Breaking ground — Tools employed — Blasting — Machine drills — Driving levels and sinking shafts, XVI, 464–69. See also Blasting, III, 701; XXIII, 662.

Mining Processes

5. Employment of labor, XVI, 469.

6. Securing excavations by timber, iron, or masonry, XVI, 469–71.

7. Working away of veins, beds, and masses, XVI, 471–76.

8. Carriage of minerals along underground roads, XVI, 476.

9. Raising minerals to the surface, XVI, 476–78.

10. Drainage of mines, XVI, 478–80.

11. Ventilation and lighting of mines, XVI, 480–82.

12. Means of descending and ascending, XVI, 483–84. Safety appliances, XXVIII, 642.

13. Preparation of ores, XVI, 484–88.

14. Laws relating to mining, XVI, 488.

15. Accidents in mines, XVI, 488–89.

For a general description of the methods of coal-mining in the United States, see XXVI, 208.

For statistics respecting the products of the world's mining, and especially the mineral products of the United States, see XVI, 489.

Mineral Products

For a special account and description of the minerals of any particular country, see the article relating

to that country. For instance, if you wish to know what minerals are produced in India, see under India, XII, 803. Also note such references as the following:

Minerals of the Appalachian Mountains, II, 176.

Minerals in Alaska, XXV, 113, 114.

Gold and silver in Bolivia, IV, 13.

Minerals in Borneo, IV, 51.

Minerals in Burmah, IV, 492.

Gold in California, IV, 621.

Minerals in Arabia, II, 213.

Minerals in Australia, III, 94.

Minerals in Cuba, VI, 601.

And hundreds of others of like character.

For interesting historical notes on the discovery and use of certain metals, see Metals, XVI, 68.

Special articles are devoted to all the great minerals, as follows:

The Great Minerals

Coal, VI, 43–75; classification of coal, VI, 44; origin of, VI, 45; X, 213; anthracite coal of the United States, II, 94, and XXIII, 852; coal-mining, VI, 58 (see Coalfields, in Index volume, 210); analysis of coal, VI, 74; area of coalfields in the United States, I, 597; production in the United States, XXIX, 365.

Gold, X, 659; gold-mining, X, 663, and IV, 621; gold in the United States, XXIII, 868, 869, and XXVII, 115; gold mines of America, I, 628; Alaska, XXV, 113, 114; Cripple Creek mines, XXVI, 310; product in the United States, XXIX, 365.

Silver, XXII, 76; description of silver, XVI, 397; silver and silver-mining, XXIX, 91; how silver is mined, XVI, 492; product in the United States, XXIX, 365. See also Metallurgy, XVI, 62; and Assaying, II, 633.

Iron, XIII, 284; ores of iron, XVI, 62; iron-mining in the United States, XXIII, 868; rolling-mill product of iron, XIII, 337–39; XXVII, 412–13; iron industry in the United States, XXIII, 868; product of pig iron in the United States, XXIX, 365; strength of iron, XXII, 634; XXVII, 401. See also Index volume, page 465.

Copper, VI, 308; copper-mining, XVI, 487 b″; copper-mining in the United States, XXVI, 279; production in the United States, XXIII. 870; XXIX, 365; in Michigan, XVI, 247; copper pyrites, XX, 134; copper-smelting, XXII, 771.

Lead, XIV, 374; production of lead in the United States, XXIII, 871–72; XXIX, 365, 366; in Missouri, XVI, 549; lead-mining, XVI, 487; description of lead ores, XVI, 397.

Zinc, XXIV, 823; production of zinc in the United States, XXIII, 871; XXIX, 366; treatment of zinc ores, XVI, 487 b.″

Tin, XXIII, 427; ores of, XVI, 62; production in the United States, XXIII, 882; history of mines in Cornwall, VI, 377.

Mercury, or Quicksilver, XVI, 36–40; production in the United States, XXIX, 366.

Aluminum, I, 569; XXV, 151–52; production in the United States, XXIX, 366.

Petroleum, XVIII, 726; production in the United States, XXIX, 366.

Natural Gas, XXIII, 870; value of product in the United States, XXIX, 366.

Read, finally, the article on Metallurgy, XVI, 62–68, describing the methods used industrially for the extraction of metals from their ores. See also:

Amalgamation of gold, X, 665; of silver, XXII, 76; mercurial amalgam, I, 573.

Blast furnace, IX, 738.

Assaying, II, 633.

Table of fusibility of metals, XVI, 72.

See also Chapters XXXVIII and LIII, entitled respectively *The Geologist* and *The Mineralogist.*

CHAPTER XXXVIII

The Geologist

"Sermons in stones, and good in everything."—*As You Like It.*

The practical importance of the work of the geologist is now very generally recognized. It is his to investigate not only the manner in which the evolution of the earth's great surface features has been effected, but, by studying the peculiarities of local formations, to discover what important minerals are probably concealed within the earth's crust in given situations, what is the nature of the soil, and, in general, what are the hidden mineral resources of the country. The general article on Geology, X, 189–334, by the celebrated Archibald Geikie, is a very complete and excellent introduction to the study of this science. It is amply illustrated; and the special index, on page 333, will assist the busy inquirer in finding the answer to almost any question on this subject that may be suggested.

An article of much practical interest to American readers is that on The United States Geological Survey, XXIX, 204.

The cosmical aspect of geology, X, 190–96, may be studied further by reference to the article Cosmogony, VI, 394. For additional curious hypotheses concerning the origin of the earth, see I, 407; III, 167; XVII, 150; and XXII, 592.

Dynamical Geology

Dynamical geology, especially that portion of the subject which seeks to unravel the complicated processes by which each continent has been built up, is further treated under the head of Physical Geography, X, 188–89. See also:

Mountains, XVII, 10, X, 329, and I, 547.

Volcanoes, X, 214.

Earthquakes, VII, 526 (Index volume, page 291).

Rivers, XX, 526.

Lakes, XIV, 217.

Palæontology

Palæontological geology, or the study of organic forms found in the crust of the earth, is the subject of an interesting chapter, X, 282–88. The subject is treated further in the following articles:

Distribution, VII, 232.

Birds, III, 631 (see special index, III, 673).

Ichthyology, XII, 666; I, 245.

Ichthyosaurus, XII, 734.

Mammalia, XV, 349 (see special index, XV, 453).

Mammoth, XV, 454.

Fossils of America, I, 509. Fossil footprints, XXVII, 13.

Oldest known fossils, IX, 337.

Stratigraphical geology is treated very fully in Volume X, pp. 288–329.

Archæan rocks, or formation, X, 289.

Palæozoic, X, 291.

Secondary, or Mesozoic, X, 312.

Tertiary or Cainozoic, X, 319.

Post-Tertiary, or Quarternary, X, 324.

Practical Geology

A further study of these subjects will involve references to the following topics:

Coal, VI, 43.

Coalfields and coal-mines, see Index volume, page 210.

Coalfields of America, XXVI, 208.

Caves, V, 230.

Glaziers, see Index volume, page 383.

Artesian wells, II, 563; XXV, 256.
Petroleum, XVIII, 241, 726.
Natural gas, XXIII, 870.

Many other articles which will suggest themselves to the reader as he pursues this study may be found by reference to the Index volume.

In studying the history of the science of Geology, you will find the names of a few distinguished men to whose labors and investigations we are indebted for the greater part of our knowledge concerning this subject. It may be of some interest to you to read the story of their lives. Among these, the following are specially noteworthy:

James Hutton, XII, 430.
Abraham G. Werner, XXIV, 529.
Sir Charles Lyell, XV, 102.
Hugh Miller, XVI, 330.
Geologists
William Buckland, IV, 377.
Sir Roderick I. Murchison, XVII, 56.
John Phillips, XVIII, 772.
William Smith, XXII, 188.
Alexander Winchell, XXIX, 564.
Sir J. William Dawson, XXVI, 369.
Joseph Le Conte, XXVII, 565.
Jules Marcou, XXVIII, 24.
John S. Newberry, XXVIII, 202–03.
Sir A. C. Ramsay, XXVIII, 550.
Sir Archibald Geikie, XXVII, 72.
James Dwight Dana, XXVI, 352.
Louis Agassiz, I, 245.
Alexander Agassiz, XXV, 83.
Othniel C. Marsh, XXVIII, 34.
Josiah D. Whitney, XXIX, 545.

CHAPTER XXXIX

The Seaman

"But a great book that comes from a great thinker—it is a ship of thought, deep freighted with truth, with beauty, too."
—*Theodore Parker.*

I. SHIPBUILDING.

The subject of greatest importance to all navigators is ships. The history of shipbuilding, from the first rude efforts of primitive man to the wonderful achievements of the present time, is a topic full of interest to both seamen and landsmen. In the twenty-first volume of the *Encyclopædia Britannica*, page 840, there is a very entertaining article on the development of the ship and of the art of navigation, particularly in ancient and mediæval times. The ships of the Phœnicians, the first race of seafaring men, are further described in XVIII, 818. The ships used by the Greeks in the time of Homer, and also the war vessels—biremes and triremes—used in the earliest sea-fights, are noticed at considerable length in the pages which follow. Mediæval merchant vessels are described on page 821.

History of Ships

The very full article on Shipbuilding, XXI, 845–64, contains much information of general interest. Read the introductory paragraphs, p. 845, the descriptions of the "Great Western" and the "Great Eastern," p. 852, the paragraphs on Propulsion, p. 861–62, and the section on Boatbuilding, p. 864. Read also the following articles:

Primitive boat of wicker-work, III, 364.

Whaleboat, XXIV, 555.
Boatbuilding, XXI, 864.
Boats — Rowing, XXI, 35.
Lifeboat, XIV, 573.
Canoes, IV, 716.
Catamarans, XXVI, 85.
Yachts and yachting, XXIV, 758.
Yacht-building, XXIX, 614.
Ships, etc. — Steamboat, XXII, 496.
Steamships, XXI, 862; III, 468; XXIX, 153.
Whaleback steamers, XXIX, 532.
Marine engines, XXVIII, 26.
The Great Harry, XVII, 289.
The Campania and Lucania, XXIX, 154.
The Great Eastern, IV, 357; XXI, 852.
The Great Western, IV, 357.
Oars, XXI, 35; ancient oars, XXI, 843.
Rowing, XXVIII, 626.
Sails and sail-making, XXI, 161.
Mast, IV, 427.
Spars and rigging, XXI, 623.
Rudder and helm, XXI, 631.
Nautical Subjects — Cable, IV, 552.
Capstan, V, 70.
Anchor, II, 4.
Mariner's compass, VI, 200; XV, 525.
Sailors' knots, XIV, 129.
Bends and splices, XXI, 617–19.
Log, XIV, 776.
Speed-recorder, XXIX, 136.
Marine glue, XXVII, 111.

II. NAVIGATION.

The article on NAVIGATION, or the art of conducting a ship across the ocean, XVII, 257–85, next claims our attention. The first half of this article contains a good deal of valuable historical information. The latter half is more technical and scientific, and is an exhibition of the theory and art of practical, or modern navigation. A popular course of reading would include the following articles or parts of articles:

Dockyards VII, 269; wharves, XXIX, 532.
Clearance, XXVI, 193.
Sounding, XXII, 293.
Buoys, IV, 474.
United States buoy service, XXV, 647.
Naval signals, XXII, 54; XXIX, 88.
"Law of the road" at sea, XXVIII, 598.
Fog-signals, XXVI, 669; XXVIII, 598.
Search-light, XXIX, 42.
Lighthouses, XIV, 620.
Lighthouse Board, XXVII, 598.
Life-saving service in the United States, XXVII, 595.
Sea Terms — Latitude, X, 177; XVII, 258.
Longitude, XXIII, 420; X, 167, 176.
Sextant, XXI, 760.
Mariner's compass, VI, 200; XV, 525.
Nautical Maps, or Charts, XV, 525.
Tides, XXIII, 375.
Ocean currents, X, 250; XVII, 282.
Gulf Stream, III, 18.
Trade-winds, XVI, 148.
Derelicts, XXVI, 400.
Log, XIV, 776.
Marine league, XXVIII, 30.
Harbors and docks, XXVII, 225; harbors, XI, 406.
Law of ports, XI, 421; free ports, XXVII, 34.
Bottomry, IV, 153.
Tonnage, XXIII, 470.
Salvage, XXI, 249.
Marine insurance in the United States, XXVIII, 29.
Marine hospital service, XXVIII, 28.
Captain, XVII, 301.
Boatswain, XVII, 302.
Pilot, XIX, 105.

SEAMANSHIP, XXI, 617–35. This article embraces a great variety of information relative to the duties and labors of a seaman; how to make knots, bends, and splices, p. 617 b'''; how to distinguish and name

Seamanship

the spars and rigging of different kinds of vessels, p. 622; how to lower rigging and set up stays, p. 623; how to cast anchor, p. 626; all about mooring swivels, anchors, and cables, p. 626, etc. At the end of the article, p. 632, there is a complete glossary of terms used by seamen.

Laws relating to seamen, XXI, 635–38.

Shipping laws, XXIX, 79.

International Commission for deep waterways, XXIX, 502.

Commerce on the great waterways, see Chapter XLVI, entitled *The Merchant and Trader.*

III. SEA INDUSTRIES.

Sea fisheries, IX, 211.

Whale fisheries, XXIV, 555; whale-oil, XVII, 765; whalebone, XXIV, 558; XV, 397.

Seal fisheries, XXI, 608; sealskins, IX, 737; extermination of seals, XIX, 134; XXV, 435.

Fisheries

Coral fisheries, VI, 344; XIII, 465.

Sponge fisheries, XXII, 445.

Amber deposits in Baltic Sea, I, 579.

Oyster fisheries, XVIII, 111.

Pearl oysters, XVIII, 457.

Cod fisheries, VI, 95; off Newfoundland, XVII, 393; in North Sea, IX, 222.

Mackerel fisheries, XV, 160.

Herring fisheries, IX, 221, 225.

Pilchard and Sardine fisheries, IX, 221–22; XIII, 465; XIX, 98; XXI, 322.

Salmon fisheries, XXI, 236.

Shad fishery, XXI, 763; XII, 732.

Lake fishing, II, 36.

Fishing-boats, IX, 213.

Fishing-nets, XVII, 367.

Fishery Boards and Commissions, XIX, 138.

Laws relating to fishermen, XXI, 638.

Fishery laws, IX, 234.

Fisheries of the United States, XV, 303.

Fisheries of Newfoundland, XVII, 393.

Fisheries of England, VIII, 211.

Fisheries of Canada, IV, 684.

Fisheries of Russia, XXI, 93.

IV. WONDERS OF THE SEA.

Depths of the sea, III, 17; XII, 860.

Deep-sea sounding, XXII, 293.

Description

Waves, XXIV, 440.

Tides, XXIII, 375.

Color of the sea, XIV, 605.

General description of the sea, XXI, 605.

Animals in the sea, VII, 240.

Sea-anemones, I, 119.

Sea-bear, XV, 449.

Curiosities

Sea-cat, XXI, 644.

Sea-cow, XV, 394.

Sea-cucumber, III, 412.

Sea-devil, VII, 119.

Sea-eagle, VII, 510.

Sea-elephant, XV, 450.

Sea-hare, XVI, 680.

Sea-hedgehog, X, 611.

Sea-horse, XXI, 606.

Sea-leopard, XV, 450.

Sea-lion, XV, 449.

Sea-otter, XVIII, 73.

Sea-parrot, XX, 107.

Sea-pens, I, 120.

Sea-pie, XVIII, 114.

Sea-serpent, XXI, 638.

Sea-slugs, VII, 554.

Sea-snakes, XXII, 208.

Sea-swallow, XXIII, 206.

Sea-trout, XXI, 232.

Sea-unicorn, XV, 402.

Sea-urchins, VII, 544.

Sea-wolf, XXI, 645.

V. MARINE WARFARE.

History of modern navies, XVII, 287.
The Navy of the United States, XXVIII, 180.
The Navy
Navy yards, XXVIII, 185.
Naval Academy of the United States, XVII, 309–10; XXVIII, 177.
Naval Observatory, XXVIII, 178.
Navy Department of the United States, XXVIII, 188.
Ironclads, XVII, 292–97.
Ironclad cruisers, XXVIII, 184.
Armored ships of the United States, XXVIII, 186.
The Massachusetts, XXVIII, 181.
The Kearsarge, XXVII, 482; XXVIII, 182.
Torpedo-boats, XXVIII, 28; XXIX, 189.
Torpedoes, XXIX, 303.
Submarine boats, XXIX, 188.
Turret ships, XVII, 293.
Monitors, XXVIII, 183, 184.

Marines, XV, 551.
Naval Reserves, or Naval Militia, XXVIII, 179.
Naval lieutenant, XVII, 301.
Captain, XVII, 301.
Commodore, XVII, 301.
Vice-admiral, I, 145.
Admiral, I, 141.
Embargo, XXVI, 559.
Blockade, III, 725.
Privateering, XIX, 784.
Piracy, XIX, 125.
Hovering acts, XXVII, 329.

Maritime law, XXI, 610.
Right of search, XXI, 638.

VI. MISCELLANEOUS.

Boat-races, XXVIII, 626.
Dredges and dredging, XXIX, 154.
For further references relating to ships, canals, and commerce, see Chapter XLVI, entitled *The Merchant and Trader.*

CHAPTER XL

The Railroad Man

"What Mr. Robert Stephenson recently said of the locomotive, at a meeting of engineers at Newcastle, is true of nearly every other capital invention: 'It is due,' he said, 'not to one man, but to the efforts of a nation of mechanical engineers.'"—*Samuel Smiles.*

I. DEVELOPMENT OF THE RAILWAY.

Not only railroad men, but all intelligent readers, will be interested in the story of how the modern railway has been developed from the old tramways of two hundred years ago, a story which is briefly but entertainingly told in the twentieth volume of the *Britannica*, beginning on page 230.

Evolution of the Railway

Other interesting facts relative to the development of the railroad may be learned from the following references:

Richard Trevithick, XXIII, 589.
George Stephenson, XXII, 564.
Sir Isambard Kingdom Brunel, IV, 356.

Development of railroads in the United States, XX, 264; XXVIII, 543.

Latest facts concerning railroads in the United States, XXVIII, 532.

Railroad pooling, XXVIII, 539.

Railroad financiering, XXVIII, 546.

Laws relating to railways, XX, 261.

Law of abandonment, I, 12.

Use of railways in time of war, XXIV, 370.

Railways and agriculture, I, 272 a.

II. ROADS AND BRIDGES.

Railway construction, XX, 240.

Rails, XX, 250.

Steel rails, XXVIII, 535.

Testing railway rails, XIII, 364.

Railway stations, XX, 243.

Railway bridges, IV, 254.

Mountain railways, XXVIII, 153.

Pacific railways, I, 627; XXVIII, 311, 534.

Bicycle railways, XXV, 467–68.

Street railways, XXVIII, 149.

Electric railways, XXIII, 526, 539.

Trolley railways in the United States, XXIX, 319.

Tramways, XXIII, 537; early tramroads, XX, 230.

Cable railways, XXVI, 6.

Elevated street railroads, XX, 249; XXVIII, 542.

Atmospheric railways, III, 33.

Switches, XX, 246.

Switch mechanism, XXIX, 211.

Locking mechanism for railroad switches, XXVII, 617.

Railroad frog, XXVII, 42.

The block system of railroad signals, XXV, 507.

III. ENGINES AND ROLLING-STOCK.

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Latest improvements in locomotives, XXVII, 618; XXVIII, 535.

Mogul engines, XXVIII, 535.

Richard Trevithick, XXIII, 589.

Matthias W. Baldwin, XXV, 332.

Traction engines, XXII, 549.

Traction on railroads, XX, 256.

Electricity as a motor, XXVIII, 541. See also references in Chapter XXVI, entitled *The Electrician.*

Application of electricity, XX, 260.

Electric cars, XXVI, 58.

Railroad carriages and cars, XX, 257.

Latest improvements in passenger cars, XXVIII, 536.

George M. Pullman, XXVIII, 519.

Freight cars, XXVIII, 537.

Railroad speed, XXVIII, 538.

Speed-recorder, XXIX, 136.

Safety appliances, XXVIII, 537.

Railway brakes, XX, 259.

The Westinghouse brake, XX, 259.

Standard air-brake, XXV, 572.

Snow-plows, XXIX, 113.

American Railway Union, XXVI, 374; XXVII, 529.

John Henry Devereux, XXVI, 405.

Eugene V. Debs, XXVI, 374.

See also Chapters XXIV, XXV, XXVII, and XXX in this volume, entitled *The Mechanic, The Machinist, The Inventor,* and *The Engineer.*

CHAPTER XLI

The Soldier

"In books warlike affairs are methodized; the rights of peace proceed from books."— *Richard de Bury*

I. WAR.

Among the many articles in the *Britannica* which are of special interest to the soldier, perhaps none is of greater practical value than that on War, XXIV, 364–86. This is, in short, a comprehensive treatise on the effective organization and employment of armies in active warfare. To officers in the military service its importance will be at once apparent. The first section of the article is of an historical character, and will appeal to the interest of the non-military reader as well as to that of the soldier. Other sections relate to strategy, p. 369; infantry tactics, p. 374; cavalry tactics, p. 378; and artillery tactics, p. 380. It concludes with a special chapter on naval strategy and tactics, p. 384. See Declaration of War, XXVI, 380; and War Department, XXIX, 478.

War

II. ARMIES.

The article Army, II, 489–541, is of no less interest. The history of the armies of ancient and mediæval times, which occupies the first four pages, is of importance to every student. This is followed by other historical sections equally valuable, as, Modern armies, p. 493; the British army, p. 497. After this, the great armies of the world are each described in a separate chapter:

The Army

British army, II, 501; its present condition, XXVII, 150.

German army, II, 519; its present condition, XXVII, 85.

French army, II, 525; its present condition, XXVII, 21.

Austrian army, II, 528; its present condition, XXV, 300.

Russian army, II, 531; its present condition, XXVIII, 634.

Italian army, II, 535; its present condition, XXVII, 426.

Army of modern Greece, XXVII, 161.

Other European armies, II, 536.

Army of the United States, II, 541, with a supplementary article giving the latest statistics, XXV, 244.

Army regulations, XXV, 247.

III. ARMS AND ARMOR.

Arms and armor, an historical article, with illustrations, II, 485–89.

History of the sword, XXII, 839.

Bows and arrows, II, 325.

Gunnery, XI, 263–81, and XXVII, 198.

Gunmaking, XI, 246–63; XXVII, 186–98.

Great Guns

Machine-guns, XXVII, 186.

Improvements in military rifles, XXVII, 187.

Rapid-firing guns, XXVII, 186.

Small-calibre rifles, XXVII, 190.

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Mauser-Mannlicher rifle, XXVII, 187–88.
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Greek fire, XI, 142.
Ammunition, I, 652.
The range-finder, XXVIII, 551.

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Martial Law, XXVIII, 36.
Military Academy of the United States, XXVIII, 95.
Military Colleges and Schools, XXVIII, 97.
Legion of Honor, XIV, 417.
Grand Army of the Republic, XXVII, 138.
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Soldiers' Homes, XXIX, 114.

V. IN ACTIVE SERVICE.

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Battle — Battle, III, 383–85.
Bombardment, XXV, 538.
Escalade, XXVI, 588.
Fortification, IX, 371–413.
Blockhouse, XXV, 507.
Pontoon, XIX, 470.
Ambulance, I, 584.
Forage, XXVI, 677.
Armistice, II, 484.
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VI. FORTY-SEVEN WARS.

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Persian War (B. C. 490), VI, 727; I, 426.
Peloponnesian War, XI, 91; XVIII, 543.
Wars of Alexander (B. C. 336–32), I, 425.
The Punic Wars (B. C. 264–149), V, 141.
War between Cæsar and Pompey (B. C. 48), IV, 566.
Mohammed's Wars (A. D. 623–29), XVI, 578.
Charlemagne's War (A. D. 775–800), V, 349; XIII, 479; XXI, 367.
Danish Invasions of England (835–905), I, 447.
Wars of Jenghis Khan (1200–27), XIII, 631.
The Crusades (1190–1250), VI, 549.
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CHAPTER XLII

The American Citizen

"The worth of a State in the long run is the worth of the individuals composing it." — *John Stuart Mill.*

It is proposed in this chapter to indicate a few of the leading articles in the *Encyclopædia Britannica* which relate to the science of government, and which are therefore of special interest and value to every citizen who has a voice in the conduct of public affairs, no less than to students, professional politicians, and statesmen.

Let us take as the basis of our studies the Constitution of the United States, the full text of which is given in the *Ency. Britannica* XXVI, page 267. Read next the article Constitution and Constitutional Law, VI, 275, from which you may derive some idea of the English Constitution and of the points wherein it differs from our own. Then the following courses of reading may be taken up, either independently or in the order in which they are here mentioned:

I. ON GOVERNMENT IN GENERAL.

Government, XI, 9–20. This is a thoughtful and interesting article on (1) the forms of government, and (2) the sphere of government. Under the first division is an account of the three standard forms of government: the monarchy, the aristocracy, and the republic. Then follow chapters on:

Forms of Government

The government of Rome, p. 11.
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Parliamentary government, p. 12.
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Under the second division the following topics are discussed:

Judicature, p. 15.

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See also Chapters XLIV, XLVIII, and LVI, in this GUIDE, entitled, respectively, *The Political Economist*, *The Lawyer*, and *The Public Speaker*.

CHAPTER XLIII

THE CANDIDATE FOR CIVIL SERVICE

"I have done the State some service, and they know it."— *Othello.*

History of Civil Service

THE first practical steps toward what is designated as Civil-Service Reform were taken by the United States Congress in 1853, when it passed an act providing for competitive examinations as the basis of appointment to any place in the four great classes of clerkships in Washington. Little further progress was made towards freeing the executive department of government from the abuse of official patronage until the year 1872, when President Grant appointed a commission to devise rules and regula-

lations for "admission to and continuance in the civil service of the United States." But the proposed reform met with much opposition from men who were interested in the continuance of the "spoils" system, and it was several years before any practical application of such rules and regulations could be made. During the administration of President Hayes, in 1879, the system of competitive examinations was made applicable to a few of the largest post offices, including the post office in New York. Through the persistent efforts of the opponents of official corruption, an act of Congress was passed in 1883 providing for the appointment of three Civil-Service Commissioners, who should aid the President in prescribing rules for admission, by examination, into certain branches of the civil service. This act further empowered the President to revise or modify the rules from time to time, thus enabling him to extend the system of competitive examinations as rapidly as in his judgment would conduce to the public welfare. (See XXIX, 370.)

On May 9, 1896, the President extended the provisions of the civil-service law to 30,000 additional Government employees, thus increasing the number of positions on the classified lists to 85,135.

Examinations

So many governmental positions being now obtainable, not by personal favor or the influence of friends, but by absolute proofs of ability to fill them, it has become the laudable ambition of thousands of young men and young women to pass the civil-service examinations, and thus place their names upon the lists of available candidates. Changes in the service are constantly taking place; vacancies in all departments are of frequent occurrence. About six thousand new appointments to the service of the Government are made every year. As a rule, the candidate whose grade in examination is the highest is the first to be appointed.

The Britannica a Helper

To pass one of these competitive examinations even creditably, the candidate must of course make some preparation: he must know what are the subjects he will be examined on, and he must study these subjects with special care. Now, it is a fact well worth noticing that there is no other single book in the world that contains so much information on all subjects as the *Encyclopædia Britannica;* and it is the purpose of the present chapter to show how the candidate for any branch of the civil service may utilize its information so as to obtain therefrom much practical knowledge in preparing for the examinations.

A. THE FEDERAL SERVICE.

Executive Department

All persons who assist in conducting the government of the United States may be said to be in the service of the nation. There are three general branches, or departments of government:

The Legislative Department, XXVI, 258.
The Judicial Department, XXIX, 196.
The Executive Department, XXVI, 601.

Read the Constitution of the United States, XXVI, 267.

Civil service, as generally understood, has reference only to service in the executive department of the government. In this department there are also two other branches of service:

The military service. See Chapter XLI, entitled *The Soldier*, in this GUIDE.

The naval service. See Chapter XXXIX, entitled *The Seaman*, in this GUIDE.

By an executive order issued by the President, Nov. 2, 1896, the employees of the Navy Yard are practically included in the classified service. In the War Department, also, about 10,000 employees are now subject to the civil-service regulations. Half of this number are employed under the Chief of Engineers in the improvement of rivers, harbors, and fortifications. See Chapter XXX, entitled *The Engineer*, in this GUIDE.

Members and employees of Congress, ministers, most of the foreign consuls, collectors of revenue, postmasters, and many others, including more than 100,000 persons, belong to the unclassified service, and are exempt from the civil-service regulations. It is of those only who are engaged in the classified service that we shall speak in this chapter.

Exceptions

The classified service, for which examinations are held, is divided into five distinct branches:

Divisions of the Service

(1) The Departmental Service, which includes officers and employees (except laborers and persons who have been nominated for confirmation) in the several executive departments of the District of Columbia (VI, 150; XXVI, 425), the railway mail service (XXVIII, 538), the Indian service (XXVII, 375), the pension agencies (XXVIII, 382), the steamboat inspection service requirements, the lighthouse service (XXVII, 598), the life-saving service (XXVII, 595), the mints and assay-offices (II, 633; XVI, 503), the revenue-cutter service, the sub-treasuries of the United States (XXIX, 311), the engineer departments, and all officers and employees of the executive department outside of the District of Columbia who are employed as clerks, physicians, nurses, draftsmen, engineers, watchmen, messengers, or firemen, or who are in the service of the supervising Architect's Office, or of the Treasury Department (XXIX, 311).

(2) The Custom-house service, which includes all officers and employees in any customs district whose employees number as many as five (VI, 643).

(3) The Post-office service, which includes all officers and employees in any free-delivery post-office.

(4) The Government-Printing service and

(5) The Internal-Revenue service, which includes all officers and employees engaged in these branches of service, except such as have been declared not subject to the civil-service rules.

Examination Papers

To test an applicant's fitness for a position in any of the five branches of service named above, examinations are held under the direction of the commission. The examination papers are rated on a scale of 100; and 70 marks or over are considered as establishing the candidate's eligibility for appointment. But, as already observed, those who receive the first appointments are those who stand the highest in the examinations.

I. THE DEPARTMENTAL SERVICE.

There are many positions in this service, the most important of which are the following: Clerk-copyist, messenger, watchman, typewriter, stenographer, printer's assistant, proof-reader, telegraph operator, special pension examiner, State-Department clerk, bookkeeper, weather observer, draftsman, meat inspector, fish-culturist, tagger, stock examiner, engineer and machinist, railway mail-clerk, and teachers, physicians,

nurses, and others employed in the Indian service.

What is the character of the examinations for eligibility to these positions?

How can the *Encyclopædia Britannica* aid candidates who are preparing for these examinations?

The clerk-copyist is examined in orthography, penmanship, copying, letter-writing, and arithmetic.

Clerk-Copyist

The examination in orthography includes the writing of twenty or more difficult words from dictation by the examiner. The mark on penmanship is determined by legibility, rapidity, neatness, and general appearance, and by correctness and uniformity in the formation of words, letters, and punctuation marks. In copying, the candidate is required to make a fair copy of a rough-draft manuscript, punctuating and capitalizing properly, and writing in full all abbreviated words. (See the references to punctuation and capitalization in Chapter LIX, entitled *The Writer*, in this GUIDE; also the lists of abbreviations in the *Britannica*, I, 31, and XXV, 17.) The letter-writing is intended to test the candidate's skill in simple English composition. (See Chapter LIX, entitled *The Writer*, in this GUIDE). In marking the letter, its errors in form and address (XXV, 46), in spelling, and in punctuation are considered. The letter must relate to some subject given by the examiners, as, for example, "The advantages of a common-school education." (See Chapter LVIII, entitled *The Teacher*, in this GUIDE.) The examination in arithmetic consists of problems involving the fundamental principles of the science. (See references on page 74 of this GUIDE.)

Nearly all other competitors for employment in the departmental service are examined in the branches named above. Several, such as the typewriter, the stenographer, and the telegraph operator, are required to exhibit practical tests of their skill. (See Chapter LX, entitled *The Stenographer and Typewriter*, in this GUIDE.)

Typewriter

The pension examiner is examined not only in the five subjects mentioned, but in law and pension law.

Sample Questions in Law. What is the difference between primary and secondary evidence? (See VIII, 650.)

What is marriage, and what are impediments to lawful marriage? (See XV, 572; XII, 415.)

What is divorce? (See VII, 260–65.)

Pension Examiner

For much information relative to pension laws, see XXVIII, 382.

The State-Department clerk is examined in geography, history, international law, and government. The following are sample questions:

Geography

Between what parallels and meridians does the United States extend? (See map, XXIII, 842; Parallels, XVIII, 259; Meridians, X, 176.)

What are the boundaries of France (IX, 445), of Germany (X, 401), of Ohio (XVII, 754), of Vermont (XXIV, 180)?

(Study the references in Chapter XIII, entitled *Readings in Geography*, in this GUIDE.)

History

What circumstances led to the war with Mexico? (XXIII, 805.)

Mention the leading facts in the life of Franklin. (IX, 626.)

Name the political parties in the national election of 1860. (XXIII, 813 *et seq.*)

(Study the *Readings in History*, Course I, in Chapter VI in this GUIDE; also Chapter XLII, *The American Citizen.*)

What is international law? (XIII, 196; XXII, 488.)

International Law

Give some account of the origin and meaning of the "Monroe doctrine." (XIII, 198; XVI, 787; XXIII, 798; XXVIII, 125.)

What are the rules regulating sovereignty over the high seas? (XIII, 201; XXI, 610.)

What are the functions and powers of the Secretary of State? (XXIX, 151.)

Government

To what extent are the various States of the Union sovereign powers? (XXVI, 269, 270.)

What constitutes a treaty? (XXIII, 564.)

Study the references given in Chapter XLII, entitled *The American Citizen*, in this GUIDE.

The observer in the weather bureau is examined in meteorology and physics, as well as in the five general branches previously mentioned. Some of the questions are similar to the following:

Explain how a barometer may be used in determining the height of a mountain. (III, 329; XIX, 253.)

How are the freezing and boiling points of a thermometer determined? (XXIII, 308; XI, 502.)

Meteorology

What is relative humidity, and how is it obtained? (III, 30 a″; XII, 604.)

See Atmosphere, III, 26, 329; X, 188, 196; Meteorology, XVI, 119; Winds, XVI, 148; Temperature (Heat), XI, 495; Climate, VI, 3; Frost, X, 235, 248; Rain, XVI, 132; Snow, XVI, 159; Corona, VI, 380; and especially Chapter XIV, entitled *A Brief Course of Reading in Meteorology*, in this GUIDE.

What is meant by the density of a body and what substance is taken as the standard of comparison? (XV, 706; VII, 210.

Physics

State three laws of falling bodies. (XI, 60.)

See Chapter XVI, entitled *Two Courses of Reading in Physics*, in this GUIDE.

The topographic draftsman is examined specially in geography, scale-drawing, and geographic projections. The scale-drawing consists of compiling, on an enlarged scale, a chart, a copy of which is furnished at the time of examination. See Cartography, XV, 523; X, 171; Topographic Maps, XV, 529; Drawing, VII, 385; XV, 634. Geographic projections relate to the theory of polyconic and Mercator projections, and to instruments and appliances necessary to construct polyconic projections. See X, 186–87.

Draftsman

The meat inspector is examined in veterinary anatomy and physiology, in veterinary pathology, and in meat inspection. He may be asked many questions similar to the following:

Meat Inspection

Name and give the situation of the organs which should be examined for the detection of tuberculosis in cattle. (XXIV, 220.)

What are the symptoms of milk, or parturient, fever? (XXIV, 221.)

What is pus composed of, and how does it appear to the naked eye? (XXII, 717.)

What are the characteristics of good, sound flesh meat? (XV, 792.)

Describe the appearance and give the life history of trichinæ. (XVII, 335 a′; XXIV, 223.)

See also Animals, II, 44; Animal Physiology, XIX, 13; Animal parasitism, XVIII, 262; Beef-measle, XXIII, 57; Poisonous, tainted, or diseased meat, XV, 792; Diseases of Cattle, XVII, 63,

etc. Also Chapter XXXVI, entitled *The Stock-Raiser and Dairyman*, in this GUIDE.

Fish Culture

The fish-culturist is examined, in addition to other subjects, in geography and fish-culture. The questions in geography have reference principally to the United States, and presuppose an intimate knowledge of the lakes, seas, and waterways of the western continent. The examination in fish-culture is intended to test the competitor's knowledge concerning the geographical distribution of fishes (XII, 707); definition and description of varieties (XII, 723); methods of reproduction (XX, 421); conditions of successful fish-culture (XIX, 135; XXI, 237); transport of fish (IX, 212); propagation of different species, etc.

See Salmon, XXI, 231, 235, 237; Shad, XXI, 763; XII, 732; XIX, 137; Pike, XIX, 97; Perch, XVIII, 532; Trout, XXI, 232, 236, etc. Read the articles on ANGLING, II, 30; on FISHERIES, IX, 211; on ICHTHYOLOGY, XII, 666; on AQUARIUMS, II, 189; etc.

Steam Engine

The engineer and machinist, besides being examined on the five general subjects, is required to answer questions in regard to the various parts of an engine (XXII, 490–553), and the construction of the boiler (XXII, 517); and to exhibit a practical knowledge of packing, repairing, and managing engines and boilers. See Chapter XXX, entitled *The Engineer*, in this GUIDE.

Railway Mail-Clerk

The railway mail-clerk is examined specially in the geography of the United States (XIX, 595; XXIII, 824); in railway and other systems of transportation in the United States; and in reading addresses.

The candidate for this examination will find many articles in the *Britannica* that will be of assistance to him. See Chapter XL, entitled *The Railroad-Man*, in this GUIDE; also

Post Office, XIX, 578.

International Postal Union, XIX, 601.

Plan of U. S. postal service, XIX, 595.

Postal Service in the United States, XXVIII, 467.

Railways in the United States, XXVIII, 532.

His examination in Arithmetic may embrace some such questions as this: A railway mail-clerk decided to save $\frac{1}{3}$ of his salary during one year, but, instead, he saved $\frac{3}{8}$, and found that during the year he had saved $30 more than he had decided to save. What was his salary?

The Indian Service. The examinations for this service are for the most part topical rather than textual. Instead of questions, the candidate is given topics upon which to write essays or to prepare lessons, and these are intended to test his knowledge of the subject, particularly his ability to prepare exercises for teaching.

Indian Teacher

The candidate for a position as teacher in the Indian schools is examined in penmanship, orthography, pedagogy, arithmetic, geometry, geography, natural history, history and government of the United States, drawing, American literature, and physiology and hygiene.

In pedagogy he is required to write an essay on some practical pedagogic question, such as: "The advantages and disadvantages of periodical written examinations in the intermediate grades of school work." See Chapter LVIII, entitled *The Teacher*, in this GUIDE.

In arithmetic, besides solving given problems, he is required to write his opinions upon some practical teaching

point, as: "The proper method of teaching decimal fractions to children 9 to 12 years of age." See Chapter LVIII, entitled *The Teacher;* also the references to Arithmetic in Chapter XV of this GUIDE.

In geometry he is required to write an essay of 100 to 150 words, on some topic assigned. The following topic has been used: "The method to be pursued in imparting a knowledge of point, line, surface, and volume, to a class of pupils in the intermediate grade." See Geometry, p. 75, in this GUIDE.

In geography, topics like the following are to be written on: "What plan would you pursue in imparting to young pupils a knowledge of the earth's motions and of the location of the zones of climate? See Section II ("A View of the World") of Chapter XIII, entitled *Readings in Geography*, in this GUIDE.

In natural history, topics like the following have been used: "State your method of imparting to advanced classes a knowledge of the habits, characteristics, etc., of the family *Ovidæ* (sheep)." See XXI, 820; XV, 438. Also make use of Chapter XI, entitled *Readings in Zoölogy*, in this GUIDE.

In American history and government, the candidate is required to write an essay of 150 to 300 words on some such topic as this: "A description of the war of 1812, written in a manner to interest children." See Chapter XLII, entitled *The American Citizen*, and Chapter VI, entitled *Three Courses of Reading in History*, in this GUIDE.

In American literature the following topic has been used: "A method of outlining and teaching American literature to advanced primary pupils." See Course the First of Chapter VII, entitled *Five Courses of Reading in the History of Literature*, in this GUIDE.

In physiology and hygiene, an essay is required on some such topic as this: "The anatomy, physiology, and hygiene of respiration, as you would explain them to a class of pupils in intermediate grades." See Anatomy, I, 700–800; Physiology, XIX, 11–50; Hygiene, XII, 600, etc.; also Chapter L, entitled *The Physician*, in this GUIDE.

Indian Physician

The candidate for a position as physician in the Indian service is examined specially in anatomy, physiology, chemistry, materia medica, therapeutics, general pathology, the theory and practice of medicine, surgery, medical jurisprudence, toxicology, hygiene, and obstetrics. See Chapter L, entitled *The Physician*, in this GUIDE.

Sample Questions: Describe the location and course of the popliteal artery. (I, 794b.'")

Give the origins and attachments of the biceps muscle. (I, 736.)

What is iron rust chemically? (XIII, 285.)

Give the differential diagnosis of rubeola and scarlatina. (XV, 663; XXI, 393; XVIII, 414.)

What is dysentery? (VII, 505.)

How may cicatrization be hastened after a burn in which the skin has been destroyed? (XXII, 716.)

Give the characteristic features of poisoning by phosphorous. (XIX, 290.)

Indian Farmer

The Industrial teacher and farmer in the Indian service must pass an examination in penmanship, orthography, farm economy, keeping accounts, and practical farming. In farm economy he must answer five questions on the care and use of the more common tools, mechanical appliances, etc., connected with farm work. See I, 276–92. In practical farming he must answer five questions relative to

general farming and gardening operations, care of live-stock, etc. See Chapters XXXII, XXXIII, and XXXVI, in this GUIDE, entitled, respectively, *The Farmer*, *The Gardener*, and *The Stock-Raiser and Dairyman*.

II. THE CUSTOM-HOUSE SERVICE.

In the Custom-house service, examinations are held for clerks, law clerks, day and night inspectors, inspectresses, messengers, weighers, gaugers, examiners, and samplers. All are examined in orthography, copying, penmanship, and arithmetic.

Clerk

The candidate for clerk is examined specially in the elements of the English language (VIII, 349; XVIII, 795, 800); in letter-writing (see Chapter LIX, entitled *The Writer*, in this GUIDE); in the elements of geography (see Chapter XIII, entitled *Readings in Geography*, in this GUIDE); and in the history and government of the United States (see Chapter XLII, entitled *The American Citizen*, in this GUIDE).

The candidate for customs law-clerk is examined specially in the elements of the English language; in letter-writing; and in law questions. See Chapter XLVIII, entitled *The Lawyer*, in this GUIDE.

Inspector

The candidate for inspector or inspectress is examined specially in the elements of the English language, and in the geography of America and Europe. See Chapter XIII, entitled *Readings in Geography*, in this GUIDE.

Gauger

The candidate for gauger, examiner, or sampler must show his fitness for the position by answering practical and theoretical questions, and by performing practical tests in gauging, etc. See Custom-houses, VI, 643.

Gauging, XVI, 32.
Commerce, VI, 175, 181.
Tariff legislation, XXIX, 225.
Imports and Exports, XVII, 254.

III. THE POST-OFFICE SERVICE.

See the following articles:
Post Office, XIX, 595–96.
Postal Service of the United States, XXVIII, 467.
Post-Office Department, XXVIII, 470.
Free-Delivery System, XXVIII, 468.
Universal Postal Union, XXVIII, 469.

Letter Carriers

The classified postal service embraces only clerks and carriers. To test the fitness of a candidate for this service, examinations are provided, which include the following subjects: Orthography, copying, penmanship, arithmetic (fundamental rules, fractions, and percentage), elements of the geography of the United States, local delivery, reading addresses, and physical tests.

See references relating to above subjects, already given for examinations for the departmental service, pp. 155–56.

IV. THE GOVERNMENT PRINTING SERVICE.

Printers

Candidates for any of the trades positions in this service must show that they have had five years' experience at the particular trade for which they desire to be examined. The examination embraces the following subjects: Orthography, penmanship, letter-writing, arithmetic, practical questions. See remarks on the examination of clerk-copyist, p. 156, of this GUIDE. Under the head of practical questions, the candidate is required to perform four exercises:

(1) Correcting proof — in the same manner as in ordinary proof in a printing-office. See XXIII, 747; XXVIII, 497.

(2) a. Writing from incorrect copy, correcting errors in syntax and orthography, and properly punctuating and capitalizing. This exercise is for book and newspaper printers only. See Chapter LIX, entitled *The Writer*, in this GUIDE.

(2) b. Arrangement of a title-page and a business card. The candidate is furnished with the matter, and he is required to arrange it properly, indicating the size of type in which each line should be printed. See Chapter LXI, entitled *The Printer and the Publisher*, in this GUIDE. This exercise is for job printers only.

(3) Tabulating, or the proper arrangement of facts and figures in a table, with the appropriate general heading and box-heads.

(4) Abbreviations. Writing out in full ten words for which the abbreviations on the sheet stand, and also giving the corresponding correct abbreviations for ten other words printed on the sheet. See I, 31; XXV, 17–22.

V. THE INTERNAL-REVENUE SERVICE.

The classified internal-revenue service includes clerks, storekeepers, and gaugers employed in the collection of internal revenue. To test fitness for admission to this service, examinations of a practical character are provided on such subjects as the Commission may from time to time direct.

See National Revenue, IX, 150; also that part of Chapter XLV, entitled *The Banker and Financier*, in this GUIDE, which refers to public finances.

B. THE SERVICE OF A STATE.

Civil-service rules similar to those in force in the executive department of the federal government have been adopted in three States — in Massachusetts and Illinois by legislative enactment, and in New York by constitutional amendment. As a general thing the requirements, the questions, and the tests do not differ materially from those prescribed for candidates for similar posts of duty in the national service. In New York nearly all the State offices below that of deputy and the officials whose relations to the head of the department are of a fiduciary character are placed on the competitive list. In the other States the rules apply specially to the selection of employees in the cities which are included under the provisions of the civil-service law, and in a more limited manner to the appointment of sub-officials and assistants in the executive department of the government. In Wisconsin a legislative enactment provides for the application of civil-service rules in cities of the first class; but Milwaukee being the only city of that description, the law is inoperative elsewhere. Movements have already been commenced (Dec. 1896) for the introduction of civil-service bills in the legislatures of other States, as Pennsylvania, Maryland, Minnesota, and Colorado. It is therefore probable that within a few years civil-service rules will be in force in most if not all of the State governments.

State Laws

C. MUNICIPAL SERVICE.

Civil-service rules have been adopted and are now in effect in all the cities of New York and Massachusetts; in Chicago and Evanston, Ill.; in Milwaukee, Seattle, and New Orleans; and to a limited extent in Louisville, Ky., and Portland, Me. Movements are on

Cities having Civil Service

foot towards the adoption of such rules in many other cities, as St. Louis, San Francisco, Denver, Wheeling, and Galveston, Texas.

New York

In New York city, only deputies, private secretaries, and the holders of a few important positions are excepted from the application of these rules. Indeed, in a total of nearly 15,000 positions, all but about 75 are subject to the provisions of civil-service laws.

Chicago

Of the other cities in which the rules are now in force, Chicago and Boston may be selected as examples. In Chicago the classification includes the following divisions:

A. Medical service. See Chapter L, entitled *The Physician*, in this GUIDE.

B. Civil engineering. See Chapter XXX, entitled *The Engineer*, in this GUIDE.

C. Clerical service, comprising copyists, recorders, bookkeepers, stenographers, pages, messengers, etc.

D. Police service. See Chapter XLIX, entitled *The Magistrate and Policeman*, in this GUIDE.

E. Electrical service. See Chapter XXVI, entitled *The Electrician*, in this GUIDE.

F. Fire service. See XXVI, 646–49.

G. Mechanical engineers—persons who require a knowledge of steam engines, boilers, and other machinery. See Chapter XXV, entitled *The Machinist*, and Chapter XVI, entitled *Two Courses of Reading in Physics*, in this GUIDE.

H. Bridge service.

I. Inspection service.

J. Janitor and Elevator service.

K. Library service. See Chapter LVII, entitled *The Bookman*, in this GUIDE.

L. Labor and miscellaneous service.

Boston

In Boston the civil-service list includes nearly the same classes of workers. Here, besides (1) the clerical service, are (2) all persons doing police duty in prisons, reformatories, and other public institutions of the State and city; (3) members of the fire department; (4) members of the police department doing permanent duty; (5) engineers and drawtenders; (6) foremen and sub-foremen of laborers; (7) inspectors of work; (8) engineers and janitors employed in school buildings; (9) truant officers; and several others.

The questions for examination in the various cities relate to about the same branches and are of about the same grade of difficulty as those used in examinations for the national service. A few examples will suffice.

Candidates for health inspector are asked questions on contagious diseases (XVIII, 411); on fumigation and purification, deodorants, and disinfectants (VII, 224; XII, 603, etc.).

Examinations

Candidates for the similar position of medical inspector are supposed to be the possessors of medical diplomas, and to have had some experience in hospital practice. They may be asked to name all the infectious diseases that may become epidemic in certain localities; to describe bacteria (XXI, 415); to state methods for the suppression of tuberculosis (XVIII, 415, 869, etc.); to give the diagnosis and treatment of diphtheria, etc.

To such candidates the references given in Chapter L, entitled *The Physician*, in this GUIDE, will be of no little interest.

The candidate who aspires to the position of assistant engineer is examined, among other things, on his knowledge of the various systems of sewerage (XXI,

745; IV, 418, etc.); of coffer-dams (VI, 104); of the construction of pavements; of masonry; of piling (IV, 294); of waterworks, etc. See Chapters XXIX and XXX, in this GUIDE, entitled *The Builder* and *The Engineer*.

Applicants for positions in the detective force of district police, besides being examined in writing and the elementary English branches, are asked questions relative to crime, the detection of criminals, legal papers, and methods of procedure in criminal cases. See the references in Chapter XLIX, in this GUIDE, entitled *The Magistrate and Policeman*.

Men wishing to be employed as drivers in the fire service or in any other service of the city, may be examined as to their knowledge concerning the proper care of horses, the diseases of horses, the shoeing of horses, etc. See references in Chapter XXXVI, entitled *The Stock-Raiser and Dairyman*.

Candidates for positions in public libraries are examined upon their acquaintance with general literature and periodical literature, and their general knowledge of books. See Chapters VII and LVII, entitled *Five Courses of Reading in the History of Literature* and *The Bookman*, in this GUIDE.

Enough has now been said to point out the way whereby the candidate for a position in any department of the civil service may so utilize the vast store of information in the *Encyclopædia Britannica* as to make it a convenient and useful aid in his efforts to prepare himself for the ordeal of examination, no matter in what branch or under what division of the service.

CHAPTER XLIV

THE POLITICAL ECONOMIST

> "This is that noble Science of Politics, which is equally removed from the barren theories of utilitarian sophists, and from the petty craft so often mistaken for statesmanship by minds grown narrow in habits of intrigue, jobbing, and official etiquette — which, of all sciences, is the most important to the welfare of nations — which, of all sciences, most tends to expand and invigorate the mind — which draws nutriment and ornament from every part of philosophy and literature, and dispenses in return nutriment and ornament to all." — *Macaulay*.

Political Economy

POLITICAL ECONOMY, in its historical aspects, is the subject of an important article by J. K. Ingram, in the nineteenth volume of the *Encyclopædia Britannica*. The earliest expressions of thought on economic subjects have come down to us from the Oriental theocracies, and of these Mr. Ingram gives an interesting account in XIX, 360. This is followed by a survey of Greek and Roman notions of economics, with a full exposition of Plato's ideal system.

The economy of the Middle Ages is described at length (pp. 364–66), with some notice of the origin of trade corporations, and their influence upon the industrial forces of those early times. The three successive phases of modern economics are then treated with great

fulness (pp. 366–415). This latter and larger part of Mr. Ingram's article may be read by sections, with collateral references to other articles, as follows:

First Modern Phase — Transitional, XIX, 367.

Second Modern Phase — Mercantile, XIX, 367–71; Copernicus, VI, 307; Sir William Temple, XXIII, 187; John Locke, XIV, 758.

Third Modern Phase — Natural Liberty, XIX, 371–415.

1. Wealth and Currency. Adam Smith, XXII, 179; his "Wealth of Nations," XIX, 377–83.

Wealth in economics, XXIV, 487.

Capital, V, 64.

Money, XVI, 746; depreciation of currency, IX, 156 a.

Bullion, IV, 464–65.

Exchange, VIII, 686–96.

Silver, XXII, 76–81.

Coinage Laws, XXVI, 223.

Crime of 1873, XXVI, 309.

Finances of the United States, XXVI, 640.

Jeremy Bentham, III, 496.

Locke on money, XIV, 760; Ricardo on money, XX, 548. See also the references to money in Chapter XLV, entitled *The Banker and Financier.*

2. Banks and Banking. See especially Chapter XLV, in this Guide, entitled *The Banker and Financier;* also Savings-banks, XXI, 342; Banking in the United States, XXV, 344; and Savings-banks in the United States, XXIX, 8.

3. Population. Population considered in its statical and dynamical aspects, XIX, 527.

The Malthusian theory, XIX, 384; Thomas Malthus, XV, 346.

Immigration into the United States, XXVII, 364.

4. Taxation. See the special article on Taxation, XXIII, 91.

Ricardo, XX, 547.

Taxation and protection, IX, 663; XXVIII, 503.

Henry George, XXVII, 78.

Income tax, XXVII, 369.

Inheritance tax, XXVII, 388.

Single tax, XXIX, 97.

See other references, page 169.

5. Pauperism. See Poor-Laws, XIX, 476; XXVIII, 457.

Elizabeth Fry, IX, 706–07.

Robert Owen, XVIII, 90.

English Poor-law Parish, XVIII, 302.

Poor-law Relief, XIX, 482, 488.

English Charities, V, 348.

Charity Organization, XXVI, 114.

See also Chapter LV, entitled *The Philanthropist and Reformer,* in this Guide.

6. Labor and Wages. Special article on Labor, XIV, 166; special article on Wages, XXIV, 326.

Lassalle, XIV, 320.

Industrial Condition of Women, XXVII, 384.

Apprenticeship, II, 185.

Guilds, XI, 230.

See also Chapter XXXI, in this Guide, entitled *The Laborer.*

7. Coöperation. Communism, VI, 188; Socialism, XXII, 216; Coöperation, VI, 300.

Oneida Community, XVII, 794.

Amish, or Ammanite Community, XXV, 175.

Brook Farm Association for education and agriculture, XX, 582.

The Community at Economy, XXVI, 486.

Shakers, XXI, 773.

Fourier, IX, 432.
Saint-Simon, XXI, 207.
Robert Owen, XVIII, 90.
Plato's Republic, VI, 189.
Sociological conceptions of Comte, VI, 210.
Modern Clubs, VI, 40.
Poor-laws, XXVIII, 457.
Anarchism, XXV, 181.

8. Tariff. See the special article, Free Trade, IX, 661.
Custom duties, VI, 643.
Protection, XXVIII, 503.
Tariff, XXIX, 225.
Warehousing, XXIX, 483.

9. Political Economists. A few famous economists not named above:
Benjamin Franklin, IX, 626.
John Stuart Mill, XVI, 320.
John E. Cairnes, IV, 570.
Walter Bagehot, XIX, 410.
Arnold Toynbee, XIX, 412.
Harriet Martineau, XV, 590.
Nassau Senior, XXI, 695.
Henry C. Carey, XXVI, 61.
Edward Atkinson, XXV, 286.
David A. Wells, XXIX, 520.
Francis A. Walker, XXIX, 471.

For further references, see Chapter XLII, entitled *The American Citizen*, in this Guide.

CHAPTER XLV

The Banker and Financier

"Seest thou a man diligent in business? He shall stand before kings." — *Proverbs of Solomon.*

In this chapter it is proposed to point out a few of the articles in the *Britannica* which relate to the kindred topics, money and banking, with a brief notice of national finance.

I. MONEY.

The First Money

In the earliest ages of the world all business was carried on, and all men's needs were satisfied, by trading, or barter. The man who had wheat and wanted beef had to find some one who had a cow and was willing to exchange her for his grain. See VI, 175. But this method was so inconvenient that men finally began to try to find something that would serve as a medium of exchange. Different races, peoples, and tribes tried different mediums.

The Greeks used cattle, VI, 176;

The Chinese used iron, copper, and tea, XVI, 749;

Salt was used in Mexico, XVI, 749;

Tobacco was used by the colonists of Virginia, XVI, 749; the Indians used wampum, XXIX, 477.

Cowry shells were used in some maritime countries, VI, 474, 675;

And in other countries various other articles were used, XVI, 749.

But whatever the article may have been, it was money, and was so called. Why? What is money? See XVI, 746. What are the causes which determine the value of money? See XVI, 747.

Why were these ancient forms of money unsatisfactory? Why were metals preferable? and when were they first used for money? See XVI, 749.

Why was iron unsatisfactory?

Why were silver and gold finally selected? What are the special advantages of these two metals? See XVI, 749–50.

What is coinage? See XVI, 750; XXVI, 223.

Coins

The science of coins is called Numismatics. See the long and very interesting article on that subject, XVII, 643–80. Here under distinct headings are chapters on the history of Greek coins (p. 646); of Roman coins (p. 669); of mediæval and modern coins (p. 672); and of Oriental coins (p. 677). See also Coins of the United States, XXVI, 224.

Standards

The substance to be used in coinage having been determined upon, the next thing was to select a standard unit of value. Every country naturally adopted a standard of its own. In England this standard is the *pound* sterling. In France it is the *franc;* see XVI, 756. In the United States it is the *dollar;* see XXVI, 223.

What are the standards of other countries? And what are the principal gold and silver coins used in the countries of the world? See XVI, 758–59.

Mints

How are coins made? A complete description of the processes employed in the making of gold and silver coins may be found in the article entitled Mints, XVI, 503-14. In this article there is also a concise and very interesting history of the methods of coinage in various nations from the earliest stages of civilization to the present time. See also United States Mint, XXVIII, 109.

Since the coins of a country consist of two metals, gold and silver, how shall the ratio of one to the other be fixed? In other words, of how much more value is a certain quantity of gold, by weight, than an equal quantity of silver? This brings us to a consideration of the relative values of the two metals. Read what is said about the conflict of standards, XVI, 761–65, which you will find to be a masterly presentation of the whole subject.

Sixteen to One

In the United States the first Congress fixed the ratio at 15 to 1; that is, it was decided that fifteen pounds of silver should be considered worth as much as one pound of gold. A complete history of the coinage laws of this country since that time, written by ex-Senator John Sherman, may be found in XXVI, 223. Used as money, gold has some advantages which silver has not, and silver has some advantages which gold has not. This matter is carefully discussed in XVI, 749.

The reader of ex-Senator Sherman's article will find that the ratio of the two metals did not long remain at 15 to 1. Silver becoming more and more plentiful all the time, it followed the inevitable law of demand and supply, and became cheaper and cheaper until finally it took sixteen ounces of silver to buy one ounce of gold.

Did the ratio stay at 16 to 1? It would have done so if silver had not continued to become more and more plentiful. This whole question is ably discussed in XVI, 762–65, and in ex-Senator Sherman's article. See also the "Crime of 1873," XXVI, 309.

As to the relative increase in the world's annual product of gold and silver, see XVI, 757–61; XXII, 80. Read also the article on Bullion, IV, 464, and

the chapter on the economic production of the precious metals, XVI, 754–56. See also the account of the Monetary Conference of 1892, XXIX, 370.

II. BANKING.

In its simplest form a bank is an institution where money may be deposited for safe-keeping. See the history of the origin of banking, III, 273–74.

But banks usually lend money as well as receive it; and their profits accrue from the excess of the interest received over that which is paid out. See the following articles:

Banks

Interest, XIII, 194.

Interest in the United States, XXVII, 392.

How interest is calculated, II, 470.

Usury, XXIV, 22.

American laws on usury, XXVII, 393.

When money is deposited in a bank on a current, or drawing account, the customer may draw it out, as he requires, by means of orders called cheques. See Cheques, V, 506.

Bankers also undertake the business of collecting money for cheques, bills, and other securities which they have received from their customers. The labor of collection is much facilitated by means of bills of exchange. See the following articles:

Exchange

Exchange, VIII, 686.

Bills of exchange, III, 582.

Rates of exchange, XXIV, 58.

Interest on bills of exchange, VIII, 692.

In England bills of exchange are made payable in London. In the United States every country banker has a correspondent in one of the banks of New York. The common centre of exchange, established by the bankers of these cities to further facilitate this branch of their business, is called a clearing-house. See the following:

Clearing-house

Clearing-house, III, 283.

London Bank Clearing-house, I, 86.

Clearing-house in New York, etc., XXVI, 193.

Clearing-house certificates, XXVI, 194.

Modern banking originated with the money-dealers of Florence, Italy, as early as the 12th century. See III, 273.

It was introduced into England by the goldsmiths of London, in the 17th century. See Bank of England, III, 273–76.

A history of banking in the United States is given in a very ably written article in XXV, 344. Another article on the same subject, giving an account of the rise of state banks and their transformation into national banks, is found in III, 292–94. Still other interesting historical information on this subject is given in XXIII, 790, 800. See also:

Paper currency in the United States, XXIII, 801.

United States Currency

Greenbacks, XXIII, 823.

Bank-notes, XXV, 348.

Legal tender, XXVII, 571.

Banking system of the United States, III, 292.

Greenback Party, XXVII, 164.

With the development of commerce and the increase of exchange the business of banking has been variously subdivided. The different classes of bankers are distinguished from one another by differences in the rules which they observe in the management of their business. Hence arise the different classes of banks.

Classes of Banks

(1) Banks of deposit, III, 283.

The article on Bank Vaults, XXV, 351, is an interesting description of the latest improved burglar-proof vaults.

(2) Land-mortgage banks, III, 283. See also XVI, 875; XXIII, 634. Mortgage on land, XIV, 266, 270.

(3) Credit companies, or credit banks: In Germany, VI, 191, 301. Crédit Foncier and Crédit Mobilier, VI, 493.

(4) Discount banks, III, 283. See also Brokers, IV, 325; Brokers in America, XXV, 605; Accommodation Paper, XXV, 36.

(5) Banks of issue — national banks (XXV, 345), state banks, etc. See Bank-note, or Bank-bill, XXV, 348; United States Bank, XXIX, 399; Banking system of the United States, III, 292; XXV, 344–48; Bank-note Manufacture, XXV, 348.

(6) Savings-banks, XXI, 342.

Post-office savings-banks, XIX, 588.

Savings-banks in the United States, XXIX, 8.

Law of savings-banks, XXIX, 9.

In order that the genuineness of the coins of a government or of its paper currency may be preserved, stringent laws have been passed in most countries for the prevention of counterfeiting and the punishment of counterfeiters. See XXVI, 295.

Stock Exchange

The influence of the Stock Exchange upon the financial stability of the country will be better understood after reading the article on Stock Exchange in XXII, 585. See also Account, I, 86; Bulls and Bears, I, 87 a."

For accounts of the great financial crises that have occurred at various times, see Banking, III, 276; XXV, 347–48; and Panics, XXVIII, 325.

Famous Bankers

Some of the most famous bankers of the world deserve to be noticed here. A study of the methods by which they acquired preëminence and wealth may help to a clearer understanding of the business principles that are at the basis of success in every enterprise.

The greatest banking and mercantile houses in Europe in the 14th century were the Bardi and Peruzzi of Florence. See III, 273.

William Paterson, the chief projector of the Darien scheme and of the Bank of England, XVIII, 364.

John Law, the originator of the Mississippi scheme, XIV, 367–69.

The Rothschilds have long been known as the greatest family of bankers in the world, XXI, 7; XXVIII, 622.

An American banker, whose name should always be mentioned with reverence, because of his great services to our country, was Robert Morris of Pennsylvania, XVI, 873.

Other famous bankers and financiers might be named, such as:

Turgot, XXIII, 668–70.

The Barings, XXV, 360.

Salmon P. Chase, V, 377.

Jay Cooke, XXVI, 275.

Baroness Burdett-Coutts, XXV, 648.

Lyman J. Gage, XXVII, 53.

Hetty R. Green, XXVII, 162.

Baron Hirsch, the Jewish philanthropist, XXVII, 295.

Sir John Lubbock, XXVII, 640.

The Morgans, XXVIII, 137.

In connection with these studies, see also:

Pawnbroking, XXVIII, 365.

Pledge, XIX, 231.

Broker, IV, 325.

Safe-deposit Companies, XXVIII, 641.

Payments, XVIII, 451.

Legal Tender, XXVII, 571.

III. PUBLIC FINANCE.

In Great Britain, the Bank of England transacts the whole business of government. "She acts," says Adam Smith, "not only as an ordinary bank, but as a great engine of state. She receives and pays the greater part of the annuities (see II, 64) which are due to the creditors of the nation; she circulates exchequer bills (see IX, 159; XI, 345); and she advances to the Government the annual amount of the land and malt taxes, which are frequently not paid till some years after." This bank, therefore, occupies a place of very great importance in the finance of Great Britain.

Bank of England

But before going further let us define finance. By the finances of a country we generally understand the ways and means by which the expenditures of government, local and national, are met. Under this head, therefore, all methods of taxation are to be considered.

History of Finance

The most ancient forms of finance were taxes on produce, IX, 150. See

Taxation in Athens, IX, 150; in Rome, IX, 152.

English exchequer, VIII, 268; history of, IX, 153.

Finance a science in England, IX, 158.

Land taxes in England, IX, 159.

Taxation of the American Colonies, IX, 162.

The English Stamp Act, VIII, 320; XXIII, 784.

Income tax in Great Britain, IX, 164–65.

Tariff legislation, XXIX, 225.

The corn laws, IX, 165; VI, 362; their repeal, VI, 79, 183; XVIII, 467.

Notorious financial schemes: South Sea bubble, IX, 160; John Law's Mississippi scheme, XIV, 367; IX, 515; XV, 24; schemes of Baron von Goertz, XXVII, 114.

History of taxation in England, IX, 152–67.

After having read the foregoing articles, we are prepared for the article on Taxation, XXIII, 91, where we shall find an analysis of the economical theory in accordance with which taxation is shown to be just and equitable, or unjust and oppressive. Here, also, are considered the various species of taxes:

Taxation

Direct taxes, and indirect, XXIII, 93.

Taxes on rent, XXIII, 93.

Taxes on profits, XXIII, 94.

Taxes on capital, XXIII, 94; see also Pitt's income tax, IX, 163; income tax in the United States, XXVII, 369.

Taxes on wages, XXIII, 95; see Wages, XXIV, 326.

Tax sales, XXIX, 230.

Taxes on commodities, XXIII, 95. This leads us to a consideration of export and import duties. Read, therefore, the article on Free Trade, IX, 661–70—a masterly presentation of the whole question as viewed from a British standpoint. Then follow with

Finances of the United States, XXVI, 640.

Treasury Department of the United States, XXIX, 311.

Taxation and protection, IX, 663.

Protection in the United States, XXIII, 751, 788; XXVIII, 503.

Warehousing, XXIX, 483.

History of tariff laws, XXIX, 225.

The monetary problem, XXIX, 376.

The other side of this subject of pub-

lic finance relates to expenditures and the national debt. A number of valuable articles are presented for consideration:

National Debt

National debt, XVII, 249.

Debt of the United States, XXIII, 823; XXVI, 374.

Receipts and expenditures of the United States, XXIX, 398.

Debts of various nations, XXVI, 376.

CHAPTER XLVI

The Merchant and Trader

"I will buy with you, sell with you." — *Merchant of Venice.*

"Many times the reading of a book has made the fortune of a man — has decided his way of life." — *R. W. Emerson.*

Commerce, in its broadest signification, is traffic in goods. This traffic may be on a large scale or a small scale; it may be conducted entirely within one's own country or it may extend to foreign lands. To the merchant who is engaged in such traffic, the *Encyclopædia Britannica* affords information which it would be difficult for him to obtain from any other source. In the first place, there is no commodity in which he deals that it does not fully describe. If his specialty is dry goods, he has but to turn to the *Britannica* to learn all about silk, XXII, 61; satin, XXIV, 491; calico, VI, 433; gingham, X, 539; woolens, XXIV, 687; thread, VI, 446; and the hundreds of other articles on his shelves. If he is a grocer, he may learn with equal facility all about coffee, VI, 100; tea, XXIII, 104; spices, XIX, 106; sugar, XXII, 655; and the numberless commodities of his trade. And so, no matter what department of merchandise may be his, he will find that the pages of the *Britannica* are teeming with information for him. It is unnecessary for the Guide to specify further in this direction. Any desired article having reference to the various kinds of merchandise may be readily found by consulting the Index volume. It is rather with the general features of trading or of commerce that we propose to deal in this chapter.

Dry Goods

Groceries

Every merchant (and thousands of people who are not merchants) will be attracted by the very interesting article on Commerce in the sixth volume of the *Britannica*. This article is largely historical in character, and embraces, among other topics, the following:

History of Commerce

Antiquity of commerce, p. 176.

Free trade in Great Britain, p. 183.

Tariffs, p. 181.

Increase of International trade, p. 182.

As to the antiquity and history of commerce, we may learn still more by referring to the section on Commerce and Industry, VIII, 543, and to the sections relating to trade under the heads of Arabia, Phœnicia, etc.

For additional information concerning free trade and tariffs, together with a full discussion of the questions relating to them, see the following articles:

Free Trade

Free Trade, IX, 661; VI, 183; XIX, 403 a.

PROTECTION, XXVIII, 503.
TARIFF, XXIX, 225–27.
CUSTOMS DUTIES, VI, 643.
COLONIAL SYSTEM, XXVI, 235.
The Mercantile System, IX, 662 a'''; XIX, 367–71.

For the history and present status of international trade, see the section relating to trade under the head of each country. For example:
Trade of Algeria, I, 498.
Trade of Arabia, II, 213.
Trade of Argentina, II, 436.
Trade of Austria, III, 105, etc.
See also Imports and Exports, XVII, 254.
Foreign Commerce of the United States, XXIX, 377.
Reciprocity and retaliation, XXIX, 377.

Transportation

In any system of commerce the question of transportation is an important factor. This is clearly illustrated in the chapter relating to defective conditions of commerce in the ancient world, VI, 177.

Transportation by means of camels in caravans (V, 74) is the most ancient method known to us. Transportation by boats, along rivers and the shores of inland gulfs and seas, dates also from a very early period (XXI, 840). See such articles as

Ships

Ancient and mediæval ships, XXI, 840.
Modern ships, XXI, 845.
Shipping of the United States, XXIX, 79.
Whaleback steamers, XXIX, 532.
Notice the references in Chapter XXXIX, entitled *The Seaman*, in this GUIDE.

Water transportation in modern times has been vastly facilitated by artificial waterways called canals. The *Britannica* contains a variety of chapters relative to these highways of trade.

Canals

Canals, an historical and descriptive article, IV, 691.
Ship canals, IV, 695.
History of canals and canal-construction — a valuable article, fully up to date, XXVI, 40–46.
The Panama Canal, XVIII, 213; XXVIII, 322.
The Nicaragua Canal, IV, 701; XXVIII, 243.
The Suez Canal, XXII, 653.
The St. Lawrence Canal, XXI, 188.
The Erie Canal, XXVI, 586.
Statistics of canals in the United States, XXVI, 45.
Shipping, United States laws, XXIX, 79.
Shipping on the Great Lakes, XXIX, 79.
Commerce on Deep Waterways, XXIX, 502.

Railroads

But by far the most important method of transportation is that by railroads; and here we must refer the reader to Chapter XL in this GUIDE, entitled *The Railroad Man*.

In connection with this same topic of transportation, there are certain related subjects which are of practical interest to the trader or merchant. We mention only a few:
Carrier, V, 122.
Common carrier (in the United States) and his liabilities, XXVI, 72.
Charter-party, shipping contract, V, 375.
Freight and freight-carriers, XXVII, 35.
Grain elevators, XXVII, 136.
Bill of lading, III, 582; XXV, 477.

TOPICS OF TRADE.

Other subjects of a more or less practical character are constantly claiming the attention of every man of business.

The *Encyclopædia Britannica* discusses all these subjects in a lucid and comprehensive manner, thus answering many difficult questions, and giving much information that cannot be found elsewhere. Here are some of the topics:

Account, I, 86; XXV, 36.
Adjustment, I, 141.
Agent, I, 250.
Arbitrage, II, 273.
Average, III, 127.
Bill of credit, XXV, 477.
Bill of exchange, XXV, 477.
Bill of sale, III, 583.
Company, VI, 197.
Contraband, VI, 284.
Exchange, VIII, 686.
Excise, VIII, 697.
Insurance, XIII, 167. See Chapter XLVII in this GUIDE, entitled *The Insurance Agent.*
Partnership, XXVIII, 341.
Trade-marks, XXIII, 530; XXVIII, 359.
Corn trade, VI, 366.
Cotton trade, VI, 432.
Silk trade, XXII, 71.
Chambers of Commerce, XXVI, 106.
Commercial Law, XXVI, 243.
Commercial Museum of Philadelphia, XXVI, 243.
Trusts, XXIII, 633; XXIX, 326.
Business Colleges, XXV, 659.
Mercantile Agency, XXVIII, 71.
Mercantile Law, XXVIII, 72.
Laws affecting merchant seamen, XXI, 635.

Money

Trade-unions, XXIII, 530.

History of money, VI, 175, cowry shells used for money, VI, 474. See Chapter XLV in this GUIDE, entitled *The Banker and Financier.*

FAMOUS COMPANIES AND MERCHANTS.

The following subjects are also of more than passing interest to persons engaged in mercantile pursuits:

Merchants of the Steelyard, London, XXII, 556.
The Company of Merchant Adventurers, XXI, 865 b.'''
South Sea Company, VI, 197.
John Law and the Mississippi scheme, IX, 515; XIV, 367.
Hudson's Bay Company, XII, 347.
East India Company, II, 613; X, 166; XXVI, 480.
Dutch East India Company, X, 166.

Leisure Reading

For reading in leisure hours there are few subjects more interesting than the lives of famous men who have achieved success in their respective callings. There have been many great merchants whose biographies are well worth perusal. Read the accounts given in the *Britannica*, of

Sir Richard Whittington, "thrice lord mayor of London," XXIV, 587.
Sir Thomas Gresham, founder of the Royal Exchange, London, XI, 166.
John Jacob Astor, the great fur merchant of America, II, 644.
Stephen Girard, the merchant philanthropist of Philadelphia, X, 554.
Robert Morris, the American patriot, XVI, 873.
George Peabody, merchant and philanthropist, XVIII, 452.

CHAPTER XLVII

The Insurance Agent

"He commands us to provide and give great gifts." — *Timon of Athens.*

Insurance is the term applied to any organized method of providing against pecuniary losses from fire, shipwreck, accidents to the person, or premature death. Insurance is usually conducted by a company or corporation having ample means, which guarantees the insured, under certain conditions and to a specified extent, against loss from one or other of these contingencies. The business of insurance is very extensive, employing a vast amount of capital, and engaging the services of great numbers of men in every civilized country in the world. It is evident that to be a successful manager, or agent in any capacity, for an insurance company, a person must not only possess a fair business education, but he must know a good deal about the history, objects, and internal methods and economy of the special business in which he proposes to engage. No other single publication in the world contains more well-digested information on these subjects than is to be found in the *Encyclopædia Britannica.*

Definition

A general history of insurance in its different branches is contained in the article Insurance, XIII, 167–94.

Other topics with which every manager or agent will wish to make himself acquainted are as follows:

Company, VI, 197; XVIII, 335.

Corporation, VI, 382.

Contracts, VI, 286; XXI, 215.

Partnership contracts, XVIII, 335.

Interest, XIII, 194; calculation of, II, 470.

General Topics

Premium, XIII, 169.

Commission, II, 470.

Warranty, XXIV, 393.

Assignment, II, 637.

Fire Insurance, XIII, 168–75.

Fire Insurance in the United States, XXVI, 649.

Fire

Fire insurance in Great Britain, XIII, 170.

Insurance companies in Canada, XIII, 174.

National Board of Underwriters in the United States, XIII, 174.

Marine Insurance, XIII, 190–94.

History of marine insurance, III, 127.

Marine

Marine Insurance in the United States, XXVIII, 29.

Average in maritime commerce, III, 127.

Average in marine insurance, XIII, 193.

Lloyd's marine insurance, XIV, 747.

Life Insurance, XIII, 175–90.

Life Insurance in the United States, XXVII, 592.

Life

Annuities, II, 64.

Endowments, XIII, 175.

Expectation, or mathematical probability, XIX, 795.

Longevity, XIV, 868.

Tables of mortality, XIII, 175.

Average death-rate in different countries, XIX, 531.

Causes of death, XVII, 705.
As to suicide, XIII, 186; XXII, 662.
The bonus system, XIII, 184.
The Tontine system, IX, 158; XIII, 190.
Lorenzo Tonti, XXIII, 472.
Non-forfeiture laws in the United States, XIII, 189.

Accident or Casualty Insurance, XIII, 168.
Accident Insurance in the United States, XXV, 34.
Minor forms of insurance, XIII, 168.

Friendly Societies, IX, 685.
Coöperation, VI, 300.
Societies
Mutual-benefit orders, IX, 687.
Collecting societies, IX, 687.
Mutual-Benefit Societies in the United States, XXV, 424.
Fraternal societies, XXV, 425.
Oddfellows, XVII, 687; XXV, 425.
Order of Foresters, IX, 687; XXV, 425.
See also, in this Guide, Chapters XXIV, XLV, and XLVIII, entitled *The Mechanic*, *The Banker and Financier*, and *The Lawyer*.

CHAPTER XLVIII

The Lawyer

"Points more than all the lawyers in Bohemia can learnedly handle."
—*A Winter's Tale.*

Who is there who does not need to know something about law? It is, of course, not to be presumed that every man can be his own lawyer, for there are times when the advice and assistance of trained members of the legal profession are indispensable. Nevertheless, there are certain legal terms and processes with which every person ought to be familiar. Questions are constantly arising concerning various matters connected with the operation and enforcement of the laws, and it frequently happens that much depends upon one's ability to answer these questions readily and correctly. You might not deem it worth your while to consult a professional lawyer about such matters, and yet, if you should have a book at hand to which you could turn at once for the desired information, you would not remain in ignorance concerning them.

A Law Library
The man who has a law library, however small, has oftentimes no little advantage over the man who has neither the library nor the legal education. The *Encyclopædia Britannica* is itself, within certain limits, an extensive library of legal lore, wherein every important subject connected with this branch of knowledge receives appropriate attention. To the man of business it is better than a law library, because he can refer to it so much more readily. Then, too, its articles have none of that redundant verbiage which so often makes the ordinary law-book so tiresome and unsatisfactory. They crystallize the topics; they show the gift of brilliant minds in making principles clear above everything else.

To the young man who is desirous of following the profession of law as the business of his life, these articles are worth many times the cost of a set of the *Britannica*. The student who makes himself thoroughly familiar with all these articles in their proper sequence will know more law than many a graduate from our law colleges. Almost any man of intelligence, by following the courses of reading here indicated, may lay the foundation for a successful legal career.

Law Students

I. INTRODUCTORY.

Read the special article on LEGAL EDUCATION IN THE UNITED STATES, XXVII, 569. Then, keeping well in mind the points therein mentioned, study the article on LAW, XIV, 355, which is of itself "as good as a condensed Blackstone."

Then read, as occasion may permit, the following articles or parts of articles:

Codes

The origin of law, VIII, 548.
Plato on law, XIX, 221.
Roman schools of law, XIV, 164.
Roman law, XX, 686.
Justinian's codification, XIII, 801; VI, 95; XX, 731.
Early English law, VIII, 250.
Administration of law in England, VIII, 237.
English codes of law, VI, 95.
Codes of Roman law, XX, 729.
The Code Napoleon, IX, 541; XVII, 212.
Inns of Court, XIII, 93.
Jurisprudence, XIV, 355.

II. LAWS IN HISTORY.

Institutes of Manu, IV, 184 a'; XII, 821 note; XXI, 301.
Laws of Moses, III, 548; XVI, 888; XIII, 407.
Laws of Confucius, VI, 229.
Laws of Mohammed, XVI, 613, 616.
Laws of Lycurgus, XXII, 384.
Laws of Solon, XXII, 267–68.
Agrarian laws, I, 256.
The Salic law, XXI, 222.
Brehon laws, IV, 225; XIII, 225.
American blue laws, XXV, 511.

III. GREAT LAWGIVERS AND LAWYERS.

Moses, XVI, 888; XIII, 407.
Confucius, VI, 229.

Biographies

Buddha, IV, 381.
Mohammed, XVI, 568.
Zoroaster, XXIV, 859.
Lycurgus, XV, 96.
Solon, XXII, 267.
Justinian, XIII, 801.
Alfred the Great, I, 447.
Savigny, XXI, 340.
Thibaut, XXIII, 321.
Zachariæ, XXIV, 800.
Grotius, XI, 193.
Vico, XXIV, 228.
Sir John Fortescue, IX, 370.
Sir Edward Coke, VI, 109.
Sir William Blackstone, III, 695.
Lord Mansfield, XV, 505–507.
Lord Eldon, VII, 719–21.
Daniel Webster, XXIV, 498.
John Marshall, XV, 581.
Joseph Story, XXII, 606.
John Austin, III, 89.
James Kent, XIV, 42.

IV. GENERAL BRANCHES OF LAW.

Common Law, VI, 186.
Equity, or Chancery law, VIII, 452–53; V, 338.
Constitutional law, VI, 275.
Criminal law, VI, 520; IX, 109.
Canon law, V, 15; XIX, 513; VI, 488.
Ecclesiastical law, VII, 543.
Military law, XVI, 308; II, 513.
Martial law, VI, 459.
Commercial law, XXVI, 243.

Mercantile law, XXVIII, 72.
Maritime law, XXI, 610.
International law, XIII, 196; X, 144; XII, 155.
Foreign laws, XXVII, 5.

V. SPECIAL LAWS OR CLASSES OF LAWS.

Laws of agriculture, I, 265.
Laws relating to the tenure of land, XIV, 260; I, 361.
Homestead laws of the United States, XII, 125.
Landlord and tenant, XIV, 273.
Leases, I, 304.
Laws concerning real estate, XX, 317.
Law of fences in the United States, XXVI, 630.
Private International Law, and Interstate Commerce Laws, XXVII, 394.
Laws concerning husband and wife, XII, 415; XXVIII, 32.
Marriage laws, XV, 572.
Marriage laws in the United States, XXVIII, 32.
Laws of divorce in the United States, XXVI, 426.
Laws relating to women, XXIV, 671.
Laws regarding infants, XIII, 3.

Laws concerning personal estate, XVIII, 677.
Exemption laws of the United States, XXVI, 601.
Laws of intestacy, XIII, 203.
Laws relating to wills, XXIV, 601.
Laws of primogeniture, XIX, 752.
Partnership laws, XVIII, 334; XXVIII, 341.
Bankrupt laws, III, 295–98; XXV, 349.

Labor laws, XXVI, 571; XIV, 166.
Factory laws in the United States, XXVI, 607.
Factory laws, VIII, 739.
Laws of apprenticeship, II, 185.
Corporation laws, VI, 382.
Port laws, XI, 421.
Press laws, XIX, 729.
Corn laws, VI, 362.
Corn laws in the United States, VI, 366.
Election laws in the United States XXVI, 503.
Elections, VIII, 4.
Ballot—Australian ballot laws, III 249; XXV, 336.

Laws relating to public health, XX, 101.
Public health laws in the United States, XV, 808.
Lunacy laws, XV, 808.
Quarantine laws, XX, 159.
Burial acts, IV, 480.
Medical laws, XV, 808.

Liquor laws, XIV, 694.
Liquor laws of the United States, XXVII, 605.
Sumptuary laws, XXII, 677.

The Army Act, XVI, 309.
Riot laws, XX, 579.
Laws of treason, XXIII, 558–63.
Pension laws of the United States, XXVIII, 382.
Passport laws, XVIII, 349.
Passport laws of the United States, XXVIII, 345.

Patent laws, XVIII, 359; of the United States, XXVIII, 347.
Copyright laws, VI, 316; of the United States, VI, 323.
Recent revision of copyright laws, XXVI, 280.
English laws of copyright, XIV, 542.
International copyright, I, 631.

Municipal laws, VI, 385.
Riparian laws, XX, 580.
Sea laws, XXI, 610.

Fishery laws, XXVI, 654.
Game laws, X, 56; of the United States, XXVII, 59.

Laws of the road, XXVIII, 597.
Laws of auctions, III, 60.
Laws relating to gambling, X, 60.
Laws relating to lotteries, XV, 12.
Laws relating to travelers, XXIX, 310.
For additional references, see Chapter XLII in this GUIDE, entitled *The American Citizen.*

VI. ADMINISTRATION OF JUSTICE.

Administration of justice in primitive communities, VIII, 548.
Judicial combat, VII, 441; XVII, 843.
Areopagus, II, 424.
Supreme Court of the United States, II, 183; XIII, 798; XXIX, 196.

Courts
Judicial courts, VI, 458.
Courts of the United States, XXVI, 297.
Federal courts of the United States, XXIII, 787.
United States court of claims, XXVI, 181.
Court of private land claims, XXVI, 297.
Courts of appeal, II, 182; VI, 458; XIII, 774.
Criminal courts, VI, 458.
Justices' court, XXII, 675.

English courts of justice, VIII, 236; XX, 323.
Quarter sessions, XX, 165.
Courts of summary jurisdiction, XXII, 675.
High court of justiciary, XIII, 799.
Courts of oyer and terminer, XVIII, 109.
Courts of chancery, V, 338; XX, 323.
High court of admiralty, I, 144.
Vice-admiralty courts, I, 146; XXI, 637.

Judge, XIII, 772.

Officers
Prerogatives of Judges, XIX, 692.
Judicial costume, VI, 422.
Justice of the peace, XIII, 798.

Grand jury, XXVII, 139.
Trial by jury, VIII, 268; XIII, 793; XXIII, 589.
Trial by court-martial, VI, 459.
Contempt of court, VI, 283.

Barristers, III, 340.
Attorney, III, 55; XXV, 290.
Sheriff, XXI, 837; VI, 455.
Constable, VI, 263; XXVI, 266.
Advocates' Faculty in Scotland, XXV, 53.
For additional references, see Chapter XLIX in this GUIDE, entitled *The Magistrate and Policeman.*

VII. LAW TERMS AND LEGAL PROCESSES.

The following is a partial list of law terms and legal processes explained in the *Britannica*, to which it may be necessary at some time to refer:

Law Terms, etc.
Abatement, I, 12; XXV, 10.
Abduction, I, 35.
Abettor, I, 50.
Abeyance, I, 50; XXV, 27.
Abstract of title, XXV, 30. See also Conveyancing.
Acceptance, I, 79.
Accession, I, 79.
Accessory, I, 79.
Accident in law, XXV, 33.
Accomplice, XXV, 36.
Accord and satisfaction, XXV, 36.
Acknowledgement, XXV, 39.
Acquittal, XXV, 40.
Act of God, XXV, 40.
Ademption, XXV, 47.
Action, I, 122; XXV, 41.

Venue, XXIV, 176.
Wills, XXIV, 601.
Witness, XXIV, 657; VIII, 651.
Wreck, XXIV, 722.
Writ, XXIV, 728.

VIII. TEN BOOKS FOR LAWYERS.

Justinian's Institutes, XIII, 803.

Hunter's Exposition of Roman Law, XIV, 362.

Blackstone's Commentaries on the Laws of England, III, 695.

Littleton on Tenures, XIV, 710.

Coke's Institutes ("Coke upon Littleton"), VI, 110.

Austin's Province of Jurisprudence Determined, XIV, 355.

Sir Henry Maine's Early History of Institutions, XIV, 364.

Hobbes's Leviathan, VIII, 376.

Jeremy Bentham's Rationale of Judicial Evidence, III, 497.

Hallam's Constitutional History of England, XI, 351.

See also Chapter XLII, entitled *The American Citizen*, in this GUIDE.

CHAPTER XLIX

THE MAGISTRATE AND POLICEMAN

"Your scope is as mine own, so to enforce or qualify the laws."
—*Measure for Measure.*

THAT branch of criminal justice which comprises a methodical system for the prevention and detection of crime is very appropriately called *The Police*. The object of the police system, however, extends beyond the mere suppression of crime, and includes the regulation of whatever is injurious to the peace, morality, and welfare of the community. It is very evident that the person who is invested with authority to enforce the observance of law and order should have at least some general knowledge of the objects, aims, and methods of police justice. The history of crime and of the public efforts constantly necessary for its suppression presents many problems for the consideration of lawmakers, while at the same time it affords much food for thought to those who are entrusted with the duty of enforcing the laws. The following references will direct readers of the *Britannica* to a vast amount of interesting information relative to crime and its punishment and the various duties of the policeman. The policeman himself will find these readings not only entertaining, but in the highest degree profitable.

Criminal Justice

Ædile, Roman public officer, I, 163.

Quæstor, Roman magistrate, XX, 151.

Sheriff, XXI, 837.

Constable, VI, 263.

Magistrate, XV, 217; XIII, 772, 798.

Officers

Police Commissioners, XIX, 349.

Policemen in the United States, XIX, 354.

Police in various countries, XIX, 353–57.

Detectives, XIX, 349.

Pinkerton laws, XXVIII, 432.
Gaoler, XIX, 767.

Arrest, II, 550.
Warrant, XXIV, 391.
Subpœna, XXII, 676.
Procedure Summons, XXIV, 732; XIX, 231.
Trial, XXIII, 589.
Jury, XIII, 793.
Justice of the peace, XIII, 798.
Court of justice, XXII, 675.
Witnesses, XXIV, 657; VIII, 651; XIX, 797.
Plea, XIX, 230.
Advocate, I, 161.
Judgment, XIII, 774.
Habeas corpus, XI, 320.
Corpus delicti, XXVI, 289.
Pardon, XVIII, 276.

Crime, VI, 515.
Roman laws in relation to crime, XX, 692.
Crime Criminal law, VI, 520.
Criminal courts, VI, 458.
Criminality, XXVI, 309.
Criminal anthropology, XXV, 202.
Identification of criminals, XXVI, 310.
Bertillon system of identification, XXV, 443.
Vidocq, the famous French detective, XXIX, 443.
Treason, XXIII, 558.
Murder, Manslaughter, XVII, 58–59.
Theft, XXIII, 250.
Assault, II, 633.
Burglary, XXV, 649.
Arson, II, 556.
Forgery, IX, 364.
Libel and Slander, XIV, 504.
Crime (Lynching, etc.) in the United States, XXVII, 649.

Punishment of crime, VI, 517 b′; XIX, 766.
Punishment Punishment under Roman law, XX, 692.
Stocks, XXII, 589.
Pillory, XIX, 104.
Branks for scolds, XXV, 574.
Torture, XXIII, 490.
Drowning for punishment, XXVI, 456.
The garrote, XXVII, 68.
The knout, XXI, 100 a.‴
Whipping-post, XXIX, 537.
Capital punishment, XXVI, 52.
Imprisonment, XIX, 767.
Prisons, XXVIII, 493.
Prison reform, IX, 268, 706; XII, 333.
Elizabeth Fry, IX, 706–07.
Prison discipline, XIX, 767.
Reformatory schools, XX, 350.
Reformatories, XXVIII, 567.
Transportation of convicts, XIX, 767, 769.
Ticket of leave, convicts on, VI, 521.
Penitentiaries, XIX, 768.
Prison discipline in the United States, XIX, 783.
Workhouses, XIX, 482, 491.
For further references, see Chapter XLVIII, entitled *The Lawyer*, in this Guide.

CHAPTER L

The Physician

"Then give place to the physician, for the Lord hath created him: let him not go from thee, for thou hast need of him." — *Ecclesiasticus.*

Medicine

Medicine, the subject-matter of one of the learned professions, includes a wide range of scientific knowledge and skill. In the *Encyclopædia Britannica* it receives a large share of attention, in both its historical and its scientific aspects. The special article on this subject, XV, 804–826, gives first a synoptical view of medicine, and then, in the second part, traces its history from its small beginnings in Greece down to the present time. Let us reverse this order, and present first a series of readings or references on

THE HISTORY OF MEDICINE.

Among the ancient Greeks the actual organization of the healing art was ascribed to Æsculapius (or Asclepius), of whom we have a special notice in I, 189. We are now ready to read the section on medicine as portrayed in the Homeric poems, XV, 809; after which we can take up the following subjects in their order:

Hippocratic medicine, XV, 810.

Hippocrates, "the father of medicine," XI, 761; his surgery, XXII, 708.

Alexandrian school of medicine, XV, 811, and XXII, 708.

Roman medicine, XV, 812; Asclepiades of Prusa, II, 593; Galen, X, 22; Aretæus, II, 428.

Byzantine School of Medicine, XV, 814.

Arabian medicine, I, 706; XV, 814; Avicenna, III, 133; Averroes, III, 129; Maimonides, XV, 297.

Medicine in the Middle Ages, XV, 815.

The Period of the Renaissance, XV, 817. See also Linacre, XIV, 658; Rabelais, XX, 200; Paracelsus, XVIII, 238, and XXII, 710. See in this Guide, the references to Alchemy, p. 95.

Revival of ancient medicine, XV, 818.

Medical Associations in the United States, XXVIII, 58.

American Academy of Medicine, XXV, 32.

Medical education in the United States, XXVIII, 59.

GREAT PHYSICIANS.

John Kaye, founder of Caius College, IV, 575.

William Harvey, and the discovery of the circulation of the blood, XI, 448.

Van Helmont, XI, 569.

Borelli, and the Iatro-Physical school, IV, 47.

Francis de le Boë, and the Iatro-Chemical school, XV, 820.

Thomas Sydenham, "the English Hippocrates," XXII, 844. He was the intimate friend of John Locke, "the great sensational philosopher," who was also a thoroughly trained physician, and practiced medicine privately, XIV, 758.

Hermann Boerhaave, the organizer of the modern method of clinical instruction, III, 742.

George Ernest Stahl, originator of the theory of "animism," XXII, 461; II, 49.

Morgagni, who was the first to make morbid anatomy a branch of medical research, XVI, 848.

Albrecht von Haller, the great Swiss anatomist and physiologist, XI, 354.

William Cullen, VI, 613.

John Brown, "the last systematizer of medicine"—originator of the Brunonian system, IV, 346.

Hahnemann, founder of the Homœopathic school, XI, 333; XV, 823.

Edward Jenner, discoverer of vaccination for smallpox, XIII, 633; XXIV, 28.

Leopold Avenbrugger, inventor of the method of recognizing diseases of the chest by percussion, III, 87, 126.

Laennec, inventor of the method of physical diagnosis by the stethoscope, XIV, 201.

Erasmus Darwin, VI, 730; XV, 825.

Richard Bright, discoverer of the disease known by his name, XXV, 595.

Philippe Pinel, the originator of the humane treatment of the insane, XIX, 115; XIII, 116.

John Hunter, XII, 400–07.

John Abercrombie, I, 40.

John Abernethy, I, 49.

Erik Acharius, I, 89.

Sir J. F. E. Acton, I, 123.

Alexander of Tralles, I, 430.

Prospero Alpini, I, 544.

Charles Alston, I, 561.

Johann Conrad Amman, I, 648.

John Arbuthnot, II, 284.

Neil Arnott, II, 548.

Aspasius, II, 624.

Andrew Combe, VI, 160.

John Elliotson, VIII, 138.

Marshall Hall, XI, 348.

Charles T. Jackson, one of the discoverers of anæsthesia, XXVII, 432.

Sir Benjamin C. Brodie, IV, 323.

Austin Flint, XXVI, 662.

Rudolf Virchow, the German pathologist, XXIX, 448.

Robert Koch, discoverer of the "lymph" remedy for consumption, XXVII, 514.

Lord Joseph Lister, the originator of antiseptic surgery, XXVII, 608.

Sir Morell Mackenzie, the great throat specialist, XXVII, 672.

Louis Pasteur, discoverer of the cause and cure of hydrophobia, XXVII, 349; XXVIII, 346.

William C. Röntgen, discoverer of the Röntgen rays, XXVIII, 616.

But it is unnecessary for the GUIDE to go farther in this direction. To give a complete list of the men who have distinguished themselves in this profession would transcend the limits assigned to this chapter.

SYNOPTICAL VIEW OF MEDICINE.

See the special article on this subject, XV, 804. The following articles, or parts of articles, may also be consulted as occasion requires:

Relation of medicine to the body politic, XV, 807.

Subdivisions of medicine as an art and discipline, XV, 806.

Surgery, XXII, 707.

Surgical pathology, XXIX, 198.

Obstetrics and Gynæcology, XV, 806.

Dermatology, XXII, 128; XVIII, 274.

Ophthalmology, XVII, 802.

Laryngology, XXIII, 340.

Otology, VII, 511.

Dentistry, VII, 83; artificial teeth, XIII, 533; teeth, XXII, 115; human teeth, VII, 232.

PATHOLOGY, the doctrine of disease, XVIII, 366–418, very fully illustrated.

See Miscellaneous Topics, below.

THE HUMAN BODY.

ANATOMY, I, 700–800. This is a very complete treatise, describing the special anatomy of the human body in a state of health. It is amply illustrated with diagrams and full-page plates.

Skeleton, XXII, 113.

Muscles, XIX, 12.

Vascular system, or organs of circulation, XXIV, 103.

Digestive organs, VII, 192.

The skin, I, 787.

Nervous system, XIX, 26.

PHYSIOLOGY, XIX, 11–50. This valuable article is in two parts: Part I, general view; Part II, the nervous system.

Comparative Physiology, III, 592.

Digestion, VII, 192.

Circulation, XXIV, 106; XI, 449.

Nutrition, XVII, 686.

Absorption, I, 58; XVII, 697.

Animal heat, XVIII, 402.

Vivisection, XXIX, 456.

HYGIENE, XII, 600. This is a short article of a popular character, referring to (1) climatic conditions, (2) site of dwellings, (3) sanitation of dwellings, (4) ventilation, (5) cleansing, (6) water supply, (8) work and exercise, etc.

Dietetics, VII, 174.

Athletic training and exercise, III, 12; XXI, 66.

Ventilation, XXIV, 171.

Sanitation of dwellings, XXI, 749.

SURGERY.

The general article on this subject, XXII, 707–28, is a complete treatise of great interest and practical value. It embraces

History and Practice

(1) The history of surgery, XXII, 707.

(2) Practice of surgery, XXII, 712.

Treatment of injuries, XXII, 715.

Process of repair, XXII, 717.

Treatment of diseases, XXII, 718.

Operative surgery, XXII, 723.

The supplementary article on AMERICAN SURGERY, XXIX, 198, etc., describes the recent wonderful advancements made in the practice of this art.

Inflammation and ulceration, XXIX, 199.

Fractures, XXIX, 200.

Tumors, XXIX, 200.

Operative surgery, and the brain, XXIX, 201.

Abdominal surgery, XXIX, 202.

Surgical treatment of appendicitis, XXIX, 203.

Surgical treatment for kidney diseases, XXIX, 204.

Several other related topics are treated specially, each under its own title. Among them are

Blood-poisoning, XXI, 698.

Tracheotomy, XXIX, 307.

Detection of Bloodstains, XXV, 508.

Artificial Limbs, XXV, 261.

Surgeon's Tools, XXIX, 197.

SCHOOLS OF MEDICINE, ETC.

Allopathy, XXV, 140.

American Eclectic School of Medicine, XXV, 159.

Homœopathy, XII, 129.

Hydropathy, XII, 575; III, 379.

Isopathy, XXVII, 424.

Massage and Swedish Movements, see Ling, XXVII, 602.

Osteopathy, XXVIII, 301.

MISCELLANEOUS TOPICS.

Schizomycetes—the germ theory of disease, XXI, 415–425 (illustrated); Bacteriology, XXV, 318. The latter is an exceedingly valuable article, presenting the results of the latest researches.

Embryology, VIII, 150.

Ague, IX, 110; XV, 319; XVIII, 405–07.

Miscellaneous Topics

Anæsthesia, I, 692; XXV, 180.
Animal Magnetism, XV, 279.
Antagonism of Drugs, XXV, 199–200.
Antidotes, XIX, 288.
Apoplexy, II, 169.
Appendicitis, XXIX, 203.
Appendix Vermiformis, XXV, 212.
Auscultation, III, 87.
Bronchitis, IV, 326.
Catarrh, V, 190; XVIII, 385; of the stomach, XXII, 603.
Cholera, V, 592. The latest discoveries and theories relating to this disease are described in XXVI, 162.
Consumption, see Phthisis, XVIII, 869.
Croup, VI, 544; XXIII, 341.
Dietetics, VII, 174.
Digestive Organs, VII, 192.
Diphtheria, VII, 217.
Drowning, VII, 409.
Enteritis, XXVI, 580.
Fever, IX, 109.
Goitre, X, 658.
Gout, XI, 6.
Heart diseases, XI, 493.
Hip-joint diseases, XXVII, 292.
Hydrophobia, XII, 578.
Hypnotism, see Animal Magnetism, XV, 279.
Hysteria, XII, 635.
Inoculation, XXII, 174.
Insanity, XIII, 101.
Jaundice, XIII, 608.
Leprosy, XIV, 469.
Longevity, XIV, 868.
Malaria, XV, 319; IX, 110; XVIII, 403–405.
Measles, XV, 663.
Mesmerism, see Animal Magnetism, XV, 279.
Neuralgia, XVII, 372.
Nutrition, XVII, 686.
Ophthalmology, XVII, 802.
Paralysis, XVIII, 259.
Parasitism, XVIII, 262.
Pharmacopœia, XVIII, 744.
Phrenology, XVIII, 856.
Phthisis, XVIII, 869.
Plague, XIX, 169.
Pleurisy, XIX, 233.
Pneumonia, XIX, 261.
Poisons, XIX, 287; XVIII, 417.
Public health, XX, 101.
Quarantine, XX, 159.
Quinine, XX, 191.
Rabies, XX, 205.
Scarlet Fever, XXI, 393.
Smallpox, XXII, 172.
Stammering, XXII, 464.
Stomach, Diseases of, XXII, 603.
Stricture, XXIX, 185.
Sunstroke, XXII, 700.
Tetanus, XXIII, 217.
Throat Diseases, XXIII, 340.
Tuberculosis, see Phthisis, XVIII, 869.
Typhus, Typhoid, and Relapsing Fevers, XXIII, 718.
Vaccination, XXIV, 28.
Vascular System, XXIV, 103.
Vesical Diseases, XXIV, 204.
Veterinary Science, XXIV, 213.
Yellow Fever, XXIV, 770.

Diseases, etc.

Of shorter and less important articles on medical subjects, the number is so great that we cannot undertake to name them here. The mention of a few, as below, will serve to indicate the vast amount of medical lore contained in the *Britannica:*

Abortion, I, 53.
Achor, XXV, 38.
Acupressure, I, 123.
Anchylosis, II, 10.
Aneurism, II, 25.
Angina Pectoris, II, 28.
Asphyxia, II, 626.
Asthma, II, 643.
Ataxy, Locomotor, II, 723.

Auscultation, III, 87.
Bright's Disease, IV, 312.
Cancer, IV, 707.
Cautery, XXVI, 90.
Clubfoot, VI, 41.
Colic, VI, 126.
Corpulence, VI, 385.
Cramp, VI, 481.
Croup, VI, 544.
Diabetes, VII, 127.
Endemic diseases, XXVI, 573.
Epilepsy, VIII, 425.
Erysipelas, VIII, 470.
Glanders, X, 565.
Hydrophobia, XXVII, 349.
Paralysis, XVIII, 259.
Meningitis, XVI, 15.
Rheumatism, XX, 530.
Rickets, XX, 562.
Whooping-cough, XII, 157, etc.

REMEDIES.

Remedies are treated in a like comprehensive manner; only a few are named, merely as examples:

Antitoxin, XXV, 207.
Arnica, II, 545.
Belladonna, III, 469.
Calomel, IV, 629.
Cod-liver oil, VI, 95.
Diuretics, VII, 253.
Emetics, VIII, 157.
Epsom salts, VIII, 440.
Galbanum, X, 21.
Goa-powder, X, 630.
Mercury, XVI, 36.
Quinine, XX, 191.
Tuberculin, XXIX, 328.
Antagonism of Drugs, XXV, 199–200.

See also the references in Chapter LI, entitled *The Apothecary*, in this GUIDE.

INSTRUMENTS USED IN MEDICINE AND SURGERY.

Stethoscope, III, 87.
Eophone, XXVI, 581.
Enucleator, XXVI, 581.
Hæmocytometer, XXVII, 209.
Surgeon's tools, XXIX, 197.
Surgeon's illuminating apparatus, XXVII, 364.
Sphygmograph, XXIX, 140.
Trephine, XXIX, 315.

CHAPTER LI

THE APOTHECARY

"By medicine life may be prolonged, yet death will seize the doctor too." — *Cymbeline.*

THE word apothecary is derived from the Greek *apothéke*, the name which Galen (X, 22; XV, 813) applied to the closet or room in which he kept his medicines. In America an apothecary is often called a druggist; but in some sections of the country the term pharmacist, or pharmaceutical chemist, is frequently applied to him. Generally speaking, an apothecary is a person who compounds and sells drugs and medicines.

Definition

In 1868 an act was passed by the British Parliament prohibiting any person from engaging in this business without being registered. Since that time many of the States of the American Union have passed similar laws. In most parts of our country an apothecary is now obliged to pass an examination be-

fore a State Board of Pharmacy before he is permitted to compound medicines or fill physicians' prescriptions. In some of the States this examination is very rigid, and only such applicants as are thoroughly conversant with the principles of pharmacy and its related subjects can reasonably hope to pass the ordeal. To persons looking forward to an examination of this kind, the following references to the *Encyclopædia Britannica* will be of much valuable assistance:

History

Short history of the business of apothecary in England, II, 174.
Pharmacopœia, XVIII, 744.
International pharmacopœia, XVIII, 745.
Dispensary, XXVI, 424.
Pharmaceutical chemists, XV, 809.

Materia Medica, XVIII, 744–45.
Forensic Medicine, XV, 788–94.
Organic Chemistry, V, 471.
Practical Botany, see Index, IV, 148.
Chemical affinity, I, 140, 203.
Poisons, XIX, 287; XVII, 238.
Intoxicants, VII, 416.
Narcotics, XVII, 237.
Stimulants, VII, 178.
Tonics, XXIX, 301.
Anæsthetics, XVII, 237.
Anæsthesia, I, 692.

Some Things in the Apothecary's Stock

Alcohol, I, 415.
Quinine, XX, 191.
Opium, XVII, 238, 809.
Morphia, XVII, 238, 815.
Chloroform, V, 590.
Chloral, V, 587–89.
Cocaine, VI, 605; XXVI, 218.
Acetylene, or Ethine Gas, XXV, 37.
Antacids, XXV, 199.
Antipyrin, XXV, 205.
Antitoxin, XXV, 207.
Aromatic Vinegar, XXV, 252.
Bromide of Ethyl, XXV, 606.
Ethylamine, XXVI, 591.
Fungicides, XXVII, 47.
Hippuric Acid, XXVII, 294.

The above list might be indefinitely extended, but enough is here given to show the variety of information that the *Encyclopædia Britannica* offers to the apothecary, or pharmacist.

Consult carefully the references given in this Guide, in Chapters L and LII, entitled *The Physician* and *The Chemist.*

CHAPTER LII

The Chemist

"You are an alchemist. Make gold."
—*Shakespeare.*

HISTORY OF CHEMISTRY.

History

The advancement of the science of chemistry during the past quarter of a century has perhaps been greater than during any preceding period of similar length. The article in the American supplements to the *Britannica*, XXVI, 130–139, describes in a brief but comprehensive manner all the more important discoveries made since the year 1875. The complete history of the science is told in the fifth volume of the *Britannica*, in the very full and able article on that subject, beginning on page 397.

The first mention of chemistry is found in the dictionary of Suidas, who flourished in the 11th century (see XXII, 665). He defines it as "the preparation of silver and gold"; and all the efforts of the early chemists (whom we now call alchemists) seem to have been directed toward the finding of some method for making gold and silver.

From the 11th to the 15th century, alchemy was diligently studied by the philosophers of Europe.

This period marks the "sickly but imaginative infancy" of modern chemistry (see Alchemy, I, 406). It was Paracelsus who declared that "the true use of chemistry is not to make gold, but to prepare medicines"; see XVIII, 238.

FAMOUS CHEMISTS.

Van Helmont (1577–1644), XI, 569.

Glauber (1604–68), the discoverer of Glauber's salt, X, 602.

Robert Boyle (1627–91), discoverer of Boyle and Mariotte's law, IV, 166.

Edme Mariotte (died 1684), co-discoverer of Boyle and Mariotte's law, XV, 554.

F. Hoffman, XII, 48.

Sir Isaac Newton, who was the first to indicate the nature and modes of formation of gases, XVII, 449 (see Index).

Dr. Stephen Hales (1677–1761), who was the first to describe the air as "a fine elastic fluid," XI, 341.

Joseph Black (1728–99), the discoverer of carbonic acid gas, and the originator of the theories of latent heat and of specific heat, III, 690.

Henry Cavendish (1731–1810), the inventor of the pneumatic trough, V, 236.

Dr. Joseph Priestley (1733–1804), the discoverer of oxygen gas, XIX, 749.

Karl Wilhelm Scheele (1742–86), the discoverer of chlorine and the co-discoverer of oxygen, XXI, 404.

Lavoisier (1743–94), XIV, 353.

Dr. Dalton, originator of the atomic theory, VI, 691.

Gay-Lussac, discoverer of the laws of the combinations of gases by volume, X, 109.

Amadeo Avogadro (1776–1856), the discoverer of Avogadro's law, XXV, 309.

Jöns Jakob Berzelius (1779–1848), III, 530.

Alexander Von Humboldt, XII, 357.

Robert Hare, XXVII, 231.

Justus Liebig, XIV, 568 (see Index).

Michael Faraday, IX, 27.

William Crookes, XXVI, 317.

Robert Ogden Doremus, XXVI, 438.

The following supplementary articles will be found interesting to every chemist:

Animal Chemistry, XXV, 194.

Azotized bodies, XXV, 312.

Physiological Chemistry, XXVIII, 419.

Stereochemistry, XXIX, 157.

CHEMICAL ELEMENTS.

All the more important "elementary, or simple bodies" met with in nature are described in special articles in the *Britannica*. Among these are:

Aluminium, I, 569.

Antimony, II, 113.

Argon, XXV, 233–34.

Arsenic, II, 555.

Barium, V, 455.

Elements

Bismuth, III, 686.

Boron, V, 450.

Bromine, IV, 325.

Calcium, XIV, 654.

Carbon, V, 76.

Chlorine, V, 589.

Cobalt, VI, 75.

Copper, VI, 308; and see Index volume, p. 230.

Gold, X, 659; and see Index volume, pp. 386–87.
Helium, XXVII, 268.
Hydrogen, XII, 449.
Iodine, XIII, 208.
Iron, XIII, 284; and see Index volume, p. 465.
Lead, XIV, 374.
Magnesium, XV, 218.
Mercury, XVI, 36.
Nickel, XVII, 500.
Nitrogen, XVII, 528.
Oxygen, V, 415.
Phosphorus, XVIII, 827.
Platinum, XIX, 201.
Potassium, XIX, 605.
Silicon, V, 451.
Silver, XXII, 76; and see Index volume, p. 829.
Sodium, XXII, 253.
Sulphur, XXII, 667.
Tin, XXIII, 427.
Zinc, XXIV, 823.

A complete list of the elements, so far as now known, is given in XXVI, 131. The discovery of several new elements is described in XXVI, 134–35.

A FEW ADDITIONAL TOPICS.

Atomic theory, V, 402.
Molecular weights, V, 408.
Periodic law, V, 470–71.
Diffusion, VII, 186–92.
Electrolysis, VIII, 13 b‴, 99–108; VII, 190.
Chemical notation, V, 408.
Organic Chemistry, V, 471; XXVI, 138.
Animal chemistry, XXV, 194.
Formulæ of Organic Compounds, V, 474.
Classification of Organic Compounds, V, 478.
Hydrocarbons, V, 482.
Haloid ethers, V, 490.
Ethers, V, 491.
Aldehydes, V, 492.
Ketones, V, 492.
Organic acids, V, 493.
Ethereal salts, V, 496.
Organo-metallic bodies, V, 497.
Amides, V, 501.
Aniline, II, 43–44.
Unclassified organic compounds, V, 502.

CHAPTER LIII

The Mineralogist

"Stones whose rates are either rich or poor,
As fancy values them." —*Measure for Measure.*

Mineral Species

A complete description of mineral species, illustrated with numerous diagrams and cuts, is given in XVI, 395–448. Very many of the minerals there described are noticed at greater length in special articles. The following are a few of the most important:

Alabaster, I, 389.
Alum, I, 566; XVI, 419.
Aluminium, I, 569.
Amber, I, 579.
Amethyst, I, 646.
Anthracite, II, 94.
Antimony, II, 113.
Arsenic, II, 555.
Asbestos, II, 590.
Asphaltum, II, 625.
Barytes, III, 350.
Beryl, III, 530.

Bismuth, III, 686.
Bitumen, XVI, 447.
Borax, IV, 45.
Calcite, X, 203.
Calc-spar, IV, 579.
Calomel, IV, 629.
Carbuncle, V, 79.
Carnelian, I, 248.
Chalcedony, I, 248.
Chalk, V, 323.
Cinnabar, V, 686.
Clays, X, 212.
Coals, VI, 43–75; II, 94; X, 213; XXIII, 852; I, 597; and Index volume, p. 210.
Cobalt, VI, 75; XX, 28.
Copper, VI, 308; XVI, 247, 472; XX, 134; XXII, 771; XXIII, 870; XXVI, 279; XXIX, 365.
Copperas, VI, 312.
Diamond, VII, 140; diamond mining, XVI, 475; in South Africa, V, 38; XXVII, 496; in Brazil, IV, 201; in India, XII, 805; cutting diamonds, XIV, 298.
Emerald, VIII, 156.
Emery, VIII, 157.
Feldspar, X, 203.
Flint, IX, 285.
Fuller's Earth, IX, 716.
Galena, XIV, 375.
Garnet, X, 73, 203.
Gold, X, 659; I, 628; IV, 621; XXIII, 868, 869; XXV, 114; XXVI, 311; XXVII, 115; XXIX, 365.
Graphite, XVI, 397.
Gypsum, XI, 313.
Hornblende, X, 203.
Hornstone, XVI, 405.
Ice, XII, 646.
Iceland-spar, IV, 580.
Iron, XIII, 284; XVI, 62; XX, 134; XXII, 634; XXIII, 867–68; XXVII, 401–13; XXIX, 365; and Index volume, p. 465.
Jasper, XIII, 606.
Jet, XIII, 683.
Kaolin, XIV, 3, 92.
Lead, XIV, 374; XVI, 397 b″, 487 b′, 545 a′; XXIII, 871–2; XXIX, 365, 366.
Lignite, VI, 45.
Limestone, X, 207.
Loam, XVI, 442.
Magnesia, XV, 218.
Manganese (red), XVI, 414.
Marble, XV, 535.
Marl, IV, 250.
Meerschaum, XV, 834.
Mercury, XVI, 36; XXIX, 366; also Index volume, p. 581.
Meteoric Iron, XIII, 291.
Mica, X, 203.
Naphtha, XVII, 181.
Nickel, XVII, 500.
Opal, XVII, 799.
Petroleum, XVIII, 726; as fuel, IX, 710.
Platinum, XIX, 201.
Pyrites, XX, 134.
Quartz, XX, 166.
Rock-salt, X, 204; XXI, 241.
Ruby, XXI, 53.
Salt, XXI, 239; mines in Austria, III, 104; on Caspian Sea, V, 155; production in the United States, XXIII, 872; XXVIII, 656.
Saltpetre, XXI, 247.
Sapphire, XXI, 317.
Sapphirite, XVI, 426 a.″
Shale, XVI, 442; bituminous, XVIII, 244.
Silver, XXII, 76; II, 633; XVI, 62, 397, 492; XXIX, 91, 365.
Slate, XXII, 135; quarries of, XVI, 475.
Sulphur, XXII, 667; mines in Sicily, XXII, 36, in Formosa, V, 553.
Talc, X, 203.
Tin, XXIII, 427; VI, 377; XVI, 62; XXIII, 883; XXIX, 290–92.
Topaz, XXIII, 474.
Tourmaline, X, 203; XVI, 426 a.‴
Umber, XVI, 443.
Zinc, XXIV, 823; XVI, 487; XXIII, 871; XXIX, 366.

CHAPTER LIV

The Preacher and Theologian

"I preached as never sure to preach again,
And as a dying man to dying men."
—*Richard Baxter*, 1650.

"The altitude of literature and poetry has always been religion — and always will be." — *Walt Whitman.*

Religious Knowledge

The *Encyclopædia Britannica*, embracing as it does the whole range of human knowledge, must necessarily devote a large amount of attention to subjects connected with the religious history and religious thought of the world. The number of articles which it contains of this kind, their comprehensiveness, and the breadth of scholarship which they display, are alike amazing. Few private theological libraries contain so much matter of a quality that is so uniformly excellent. To the minister, the pastor, the church official, and the theological student the *Britannica* offers a fund of information and a wealth of knowledge which can be derived from no other single publication in the English language. It is not the intention in this chapter to point out all the articles that relate to theological or religious subjects. To do so would oblige us to go beyond the limitations assigned to this volume. It will be sufficient to name a few of the most important subjects, as the reader, when once fairly introduced into this department of knowledge, will be able readily to refer to others of a similar character.

I. Religions.

Five Great Religions

The special article on the religious beliefs and modes of divine worship peculiar to different tribes, nations, and communities, written by Professor C. P. Tiele, of the University of Leyden, XX, 370–84, will be an excellent introduction to this course of study. It may be followed by the reading of such additional articles as these:

1. Christianity, V, 598–610, a comprehensive survey of the history and influence of Christianity, by Professor T. M. Lindsay, of Free Church College, Glasgow.

2. Judaism. See the two articles, Israel, XIII, 406–41, and Jews, XIII, 690–98. These articles are chiefly historical, the first by Dr. Julius Wellhausen, of the University of Halle; the second by Israel Davis, of London. See also Jews in the United States, XXVII, 464.

3. Brahmanism, IV, 182–90, by Dr. Julius Eggeling, of the University of Edinburgh.

4. Buddhism, IV, 381–92, by Dr. T. W. Rhys Davids, of London.

5. Mohammedanism, XVI, 568–628, a very comprehensive article in three parts:

Part I. Mohammed, by Professor Wellhausen.

Part II. The Eastern Caliphate, by Professor Stanislas Guyard.

Part III. The Koran, by Professor Nöldeke.

Other Beliefs

Besides the above, there are special articles on all other religious beliefs and systems that have ever exerted any considerable influence upon the thought of mankind. The following articles will be interesting to many readers:

Animism, II, 49–52.
Fetichism, IX, 103.
Druidism, VII, 412.
Zoroastrianism, XXIV, 861; XVIII, 618.

For an account of the religion peculiar to any given country, see the article devoted to that country; for example:

Religion in Mexico, XVI, 219 a.
Religion of Hottentots, XII, 325 a.
Religions in India, XII, 821 b.
Religion in Abyssinia, I, 63.
Religion in Africa, I, 237.
Religion of gypsies, X, 549, etc.

II. BELIEF IN GOD.

Closely allied in thought to the articles mentioned above are such as the following:

Theism, XXIII, 253–69. This embraces a survey of primeval religious ideas, with notices of polytheism, monotheism, trinitarianism, unitarianism, deism, mysticism, agnosticism, etc.

Deism, VII, 31.

Theosophy, XXIII, 298; XXIX, 267; Madame Blavatsky, XXV, 502; William Q. Judge, XXVII, 468; Annie Besant, XXV, 443.

Kabbalah, XIII, 820.
Rationalism, XX, 301.
Agnosticism, XXV, 85.
Idolatry, XII, 737.
Fetichism, IX, 103.
See also God, in Index volume, p. 385.

III. DOCTRINE, ETC.

Read the special article on Theology, XXIII, 280–96; also the following:

Apologetics, II, 166; XXVI, 597.

Christian Doctrine

Evidences of Christianity, XXVI, 597.

Dogmatic, VII, 288–97, a "branch of theological study which treats of the doctrines of Christianity."

Hermeneutics, XI, 663–69, "which treats of Scripture interpretation."

Harmony of the Gospels, XXVII, 233.

Eschatology, VIII, 472–76, "the doctrine of the last things."

Creeds, VI, 494–500, "authorized formularies of Christian doctrine."

To these longer articles many others might be added, such as:

Immortality. See Butler, IV, 520; Plato, XIX, 210, 221; Vedanta, XXIV, 128–30.
Christology, XXVI, 166.
Incarnation, X, 721; XXVI, 166.
The Holy Ghost, XXVII, 307.
Procession of the Holy Spirit, XXVIII, 495; XI, 139 b.
Predestination, XIX, 688–91.
Atonement, XXV, 288.
Imputation, XXVII, 368.
Justification, XXVII, 470.
Inspiration, XIII, 161.
Sanctification, XVIII, 435.
Prophecy, XIX, 836.
Anthropomorphism, II, 109.
Transubstantiation, VIII, 573; XXVIII, 609.
Consubstantiation, XXVI, 271–72.
Perfectionism, XXVIII, 386.

Antichrist, II, 109.
Apocalyptic Literature, II, 153.
Apostasy, II, 169.
Heresy, XI, 655.
Arminianism, XXV, 242.
Episcopacy, VIII, 430–37.
Apostolic Succession, XXV, 211.
Indulgence, XII, 887.
Immaculate Conception, XII, 753.
Consecration, VI, 260.
Absolution, I, 58.
Angel, II, 25–27.
Angelus Domini, XXV, 192.
Ave Maria, XXV, 307.
Beatification, XXV, 398.
Confession, VI, 228–29.
Confirmation, VI, 229.
Eucharist, VIII, 571–74.
Holy Water, XII, 109.
Missal, XVI, 531–34.
Penance, XVIII, 495–99.
Purgatory, XX, 120–21.
Sacrament, XXI, 140.
Sacrifice, XXI, 141–48.
Sacrilege, XXI, 148.
Incense, XII, 756–60.
See also the references to Christianity and Church History, below.

IV. CHRISTIANITY.

Christianity, V, 598; creeds of, VI, 494; doctrines of, VII, 288; ethics of, VIII, 518; theology of, XXIII, 258.
Christ, V, 597.
The testimony of the Gospels of Jesus Christ, XIII, 670.
Christology, XXVI, 166.
Church, V, 663.
Views of Christianity by famous writers and philosophers:
Origen's, XVII, 863.
Irenæus's, XIII, 279.
Clement's, V, 716.
Lessings, XIV, 481 b.
Locke's, XIV, 762.
Rousseau's, XIII, 680.
Voltaire's, IX, 592.

Christian Churches and Sects

1. Roman Catholic Church, XXVIII, 608, an important and very comprehensive article by Cardinal Gibbons; should be read in connection with the general article on the same subject, XX, 644–47, by P. L. Connellan, of Rome. See also Popedom, XIX, 502–24.

This last-named article is designed to give the main outlines of the history of the Papacy as an institution. A list of the popes is given at the end; and readers wishing to extend their knowledge of this subject by becoming acquainted with the personal history of the pontiffs may do so by referring to the special articles in the *Britannica* relating respectively to the different popes. The method of electing a pope is described in XXVIII, 610. The following articles may also be read:

Catholic, V, 207. For the first use of this name, see V, 10.
Catholics in America, XXVIII, 611.
Titles in the Catholic Church, XXIX, 293.
Archbishops, II, 323.
Bishops, III, 683.
Abbot, I, 27.
Acolyte, I, 92.
Celibacy, V, 254.
Propaganda, XIX, 831.
Ultramontanism, XXIX, 351.
History of Monasticism, I, 20–27, to be read in connection with
Monachism, XVI, 724;
Asceticism, II, 591;
Religious Brotherhoods, XXV, 610;
Franciscans, IX, 614;
Dominicans, VII, 307; XIII, 99;
Benedictines, III, 481; VIII, 334; XXV, 424; and

Carthusians, V, 143; I, 25.
Jesuits, XIII, 656; XVIII, 441; XXVII, 449.
Passionists, XXVIII, 345.
Paulist Fathers, XXVIII, 364.
Trappists, XXIII, 556.
Acœmetæ (sleepless monks), I, 92.
Sisters of Charity, XXVI, 117.
Old Catholics, XVII, 775.

2. Greek Church, XI, 137.
Stundists of Russia, XXI, 90; XXIX, 186.

3. Armenian Church, II, 481.

4. Protestantism, XX, 332. Of the sects of Protestantism a very large number are noticed in separate articles in the *Britannica*. The following will indicate the scope and character of these articles:

Adventists, XVI, 332; XXV, 52.
African Methodist Episcopal Church, XXV, 83.
Baptists, III, 304; Freewill Baptists, IX, 670; Baptists in the United States, XXV, 353. This article includes brief accounts of all the different bodies of Baptists now in this country.
Catholic Apostolic, V, 207.
Christian Brethren, XIX, 250.
Christian Alliance, XXVI, 164.
Congregationalists, VI, 238; in the United States, XXVI, 254.
Disciples of Christ, XXVI, 423.
Dissenters, or Nonconformists, XVII, 546; XXVI, 424.
Episcopal: Church of England, VIII, 332; Protestant Episcopal Church of the United States, VIII, 437; Methodism, XVI, 192–93.
Evangelical Association, VIII, 636; XXVI, 594.
Free Church of England, XXVII, 32.
Friends, or Quakers, XXVII, 41; XX, 154.
Independents, XII, 761.
Latter-day Saints, or Mormons, XXVII, 550.
Lutherans, XV, 85; in the United States, XXVII, 645.
Mennonites, XVI, 15; XXVIII, 70.
Methodists, XVI, 192; in the United States, XXVIII, 79.
Moravian Brethren, XVI, 837; XXVIII, 135.
Mormons, XVI, 852.
New Jerusalem Church, XXII, 797; XXVIII, 212.
Nonconformists, see Dissenters, above.
Presbyterians, XIX, 696; XXVIII, 479; Cumberland Presbyterians, XXVI, 332.
Protestant Episcopal Church, XXVIII, 506.
Quakers, see Friends, above.
Reformed Church, XX, 352; Alliance of Reformed Churches, XXV, 138; Reformed Church in America, XXVIII, 568.
Salvation Army, XXVIII, 658.
Spiritualists, XXII, 419; II, 181.
United Brethren, XXIII, 774; XXIX, 356.
Unitarians, XXIII, 772; XXIX, 354.
Universalists, XXIII, 886; XXIX, 399.

To these might be added an extensive list, embracing such names as the following:

Abecedarians, XXV, 24.
Antinomians, II, 114.
Aquarians, II, 189.
Annihilationists, VIII, 475.
Annunciada, XXV, 197.
Hussites, XII, 422.
Illuminati, XII, 745.
Latitudinarians, XXVII, 550.
Christadelphians, XXVI, 163.
The Arminian Nunnery, XXVI, 632 (Ferrar).
Winebrennerians, XXVI, 171.

But it is unnecessary to attempt a complete list. The reader who so desires will now be able to continue the

investigation of this subject without further assistance from the GUIDE.

V. CHURCH HISTORY.

As an introduction to another valuable course of reading, take the article entitled CHURCH HISTORY, V, 664.

The number of special articles, biographical and historical, relating to the history of the Christian Church may be estimated from the following incomplete list of subjects which receive treatment in the first volume alone:

Volume 1: Saint Adalbert, p. 124; Adam of Bremen, p. 128; Adiaphorists, p. 140; Adoption Controversy, p. 149; Adrian, p. 150; Ætius, p. 202; Agelnoth, p. 249; Johannes, Agricola, p. 259; Aidan, p. 377; St. Alban, p. 395; Albert (Cardinal Archbishop), p. 400; Albigenses, p. 402; Alcock, p. 415; Alcuin, p. 417; Aldred, p. 420; Aleandro, p. 421; Alesius, p. 423; Alexander of Hales, p. 429; Popes Alexander, pp. 430–33; Alleine, p. 512; Amalric of Bena, p. 574; Amat, p. 574; St. Ambrose, p. 582; Amsdorf, p. 683; Amyraut, p. 686.

Instead of continuing this list so as to cover in the same way the remaining twenty-three volumes of the *Britannica*, the GUIDE deems it sufficient to name merely a few of the most important subjects.

Select List of Topics

The history of the Christian Church may be said to begin with the preaching of St. Peter on the day of Pentecost. See, therefore, St. Peter, XVIII, 707; Pentecost, XVIII, 525; Acts of the Apostles, I, 114. After these, read:

Saint Paul, XVIII, 425.
Saint John, XIII, 717.
Saint Andrew, II, 20.
Revelation, XX, 510.
Apollos, II, 165.
Apostolic Fathers, II, 171.
Gnosticism, X, 625–28.
Philo, XVIII, 773–78.
Saint Anthony, II, 94.
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Justin Martyr, XIII, 799.
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Arius, II, 471.
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Saint Athanasius, II, 725.
Basil the Great, III, 355.
Chrysostom, V, 660.
Eusebius, VIII, 632.
Irenæus, XIII, 279.
Cyril of Alexandria, VI, 663.
Nestorius, XVII, 364.
Polycarp, XIX, 428.
Saint Barbara, XXV, 357.
Saint Agnes, XXV, 85.
Saint Epiphanius, VIII, 428.
Saint Alban, I, 395.
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Arnold of Brescia, II, 546.
Thomas à Kempis, XIV, 33.
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The Huguenots, XII, 351.
The Reformation, XX, 332.
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Thomas Cranmer, VI, 485.
John Knox, XIV, 131.
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Alexander Campbell, XXVI, 29.
Henry Ward Beecher, XXV, 407.
Lyman Abbott, XXV, 16.
Frederic W. Farrar, XXVI, 622.
Charles H. Parkhurst, XXVIII, 334.
William Booth, XXV, 546.
Christian Missions, XVI, 534.
Sunday Schools, XXIX, 195.
Epworth League, XXVI, 583.
Christian Endeavor, Society of, XXVI, 164.
Young Men's Christian Association, XXIX, 623.
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VI. FORMS, CEREMONIES, AND RELIGIOUS PRACTICES.

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Peters-Pence, XXVIII, 395.

VII. HOLY DAYS, FEASTS, ETC.

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VIII. CHURCH GOVERNMENT, ETC.

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Canon law, V, 15–21.
Apostolic canons, II, 170.
The Augsburg Confession, VI, 499 b.′
The Thirty-nine Articles, II, 571.
The Westminster Confession, VI, 500 a.‴

IX. THE BIBLE.

For a general discussion of questions relating to the Bible and its circulation to the year 1875, see BIBLE, III, 548–61. For a comprehensive account of its circulation since 1875, see XXV, 449–63. This latter article contains specimen extracts from Bibles printed in 242 languages and dialects. It is followed by a list of the Bible Societies of the world, XXV, 463, giving the number of Bibles issued by each society since its organization.

Inspiration of the Bible, XIII, 161.
The Septuagint, XXI, 699.
Wycliffe's Bible, XXIV, 746.
Tyndale's Bible, XXIII, 717.
The Geneva Bible, VIII, 347.
The Breeches Bible, VIII, 347.
King James's Version, VIII, 347.
The Douay Bible, XXVI, 440.
Bible Societies, III, 561; XXV, 463.
Bible glosses, X, 612.
Spinoza on Biblical Criticism, XXII, 417.
The Higher Criticism, XXVI, 311.
Origen on Biblical Criticism, XVII, 865; Baur, III, 387–89; De Wette, VII, 124; Morinus, XVI, 851.
Revision of the Bible, XXVIII, 581.
See also Chapter XIX in this GUIDE, entitled *Readings for Bible Students.*
See Theological Education, XXIX, 263–66.

CHAPTER LV

The Philanthropist and Reformer

"Love all, trust a few; do wrong to none."
—*All's Well That Ends Well.*

Philanthropy, in its broadest sense, is love of mankind manifested in deeds of kindness to one's fellows. While the ultimate object of all philanthropists is the same —the mitigation of misfortune and the consequent betterment of all conditions of life—the methods which they pursue are widely different, and the immediate ends toward which they aim are many and various. Some labor in missions, believing that in the spread of the Gospel of Christ there is the surest means of promoting human happiness. Some devote their energies to measures of reform, hoping that by effecting certain changes, whether in the political or the social world, mankind may be elevated to a higher plane of existence. Some have been fearless antagonists of slavery and other forms of oppression, and their voices have always championed the cause of the weak, the downtrodden, and the poor. Some labor in behalf of prison reform, and strive to bring about better and more humane methods of dealing with criminals. Some are active in deeds of charity and in the promotion of means to improve the condition of the poor. And so each philanthropist works in his own field; but all are actuated by the same impulse—the impulse of sympathy and love, the impulse to do good to suffering humanity. To all who are interested either directly or indirectly in any form of philanthropical effort, the *Encyclopædia Britannica* offers a mine of valuable information. The following lists of references, although by no means exhaustive, will be of assistance to everyone who seeks to know more about the active benevolences of the world.

Philanthropy

For a comparison between Pagan and Christian philanthropy, see VIII, 519.

I. Mission and Missionaries.

List of missionary societies, XVI, 538.

Christian missions, XVI, 534.

Missionaries

Missions in China, XIX, 832; XVI, 540.

Missions in India, XIX, 833; XXIV, 752.

Missions in Japan, XVI, 540; XIII, 662.

Roman Catholic propaganda, XIX, 831.

The Jesuit system of missions, XIII, 662, 664; XX, 550; in North America, XXVII, 449.

Baptist missions, III, 306.

Methodist missions, XVI, 539.

Moravian missions, XVI, 539 b", 837.

The McAll mission in France, XXVII, 654.

Francis Xavier, the Apostle of the Indies, XXIV, 752.

John Eliot, the Apostle of the Indians, VIII, 128; XVI, 537; XVII, 249.

Robert Morrison, missionary to China, XVI, 873.

William Carey, the father of Protestant missions, V, 90.

Adoniram Judson, missionary to India, XIII, 776.

Father Jogues, Jesuit missionary among the Mohawks, XXVII, 452.

John Williams, missionary, XXIV, 617.

Henry Martyn, missionary to Persia, XV, 593; XVIII, 660.

Thomas Gage, first missionary to Mexico, XXVII, 53.

Robert Moffat, African missionary, XVI, 566.

David Livingstone, XIV, 726; I, 222.

William Goodell, missionary in Turkey, XXVII, 123.

Stephen Grellet, French Quaker missionary, XXVII, 170.

Robert W. McAll, founder of the McAll missions, XXVII, 654.

Samuel Marsden, the Apostle of New Zealand, XVII, 484.

William A. P. Martin, president of Tungwên College, Pekin, XXVIII, 38.

II. FRIENDS OF HUMANITY.

Thomas Joseph Barnardo, "father of the don't-live-anywheres," XXV, 364.

Henri Dunant, founder of the Red Cross Society, XXVIII, 563.

Philanthropists

Clara Barton, president of the American Red Cross Society, XXV, 374.

Charles Loring Brace, XXV, 565.

Baroness Burdett-Coutts, XXV, 648.

Mary Carpenter, XXVI, 69.

George W. Childs, XXVI, 152.

Peter Cooper, XXVI, 277.

Elizabeth Fry, English Quakeress, IX, 706.

Edward Denison, originator of "university settlements," XXVI, 395.

Sarah Platt Doremus, XXVI, 439.

Henry Towle Durant, founder of Wellesley College, XXVI, 469.

Abigail Hopper Gibbons, XXVII, 92.

Stephen Girard, founder of Girard College, X, 554; XXVII, 100.

Baron Hirsch, the Jewish philanthropist, XXVII, 295; Philanthropies of American Jews, XXVII, 467.

Johns Hopkins, XXVII, 319.

Dr. Samuel G. Howe, XXVII, 331.

James Lenox, founder of Lenox Library, XXVII, 577.

James Lick, founder of Lick Observatory, XXVII, 591.

Sir Josiah Mason, founder of almshouses and orphanages, XXVIII, 43.

Sir Moses Montefiore, XXVIII, 130.

George Müller, founder of orphans' homes, England, XXVIII, 158.

Florence Nightingale, XXVIII, 246.

George Peabody, XVIII, 452; XXVIII, 367.

Samuel Plimsoll, "the sailors' friend," XXVIII, 441.

Enoch Pratt, founder of Pratt Library, XXVIII, 478.

Charles Pratt, founder of Pratt Institute, XXVIII, 477.

Matthew Vassar, philanthropist and founder of the Society for the Prevention of Cruelty to Animals, XXIX, 423.

George Williams, founder of the Young Men's Christian Association, XXIX, 556.

Sisters of Mercy, XXVIII, 73.

Sisters of Charity, XVI, 739.

John Howard, the father of prison reform, XII, 333.

Elizabeth Fry, IX, 706.

Prisoners' Friends

Theodor Fliedner, German philanthropist, IX, 268.

Enoch Cobb Wines, founder of the National Prison Association, XXIX, 567.

The Prison Discipline Society, XIX, 769.

The Howard Association, XXVII, 330.

The following references may be found interesting and valuable in connection with any study of human benevolence:

The Sanitary Commission, XXVIII, 668.

Woman's Relief Corps, XXIX, 582.

Red Cross Society, XXVIII, 563.

The education of defective, dependent, and criminal classes, XXIX, 30.

Reformatories, XXVIII, 567.
University Settlements, XXIX, 403.
Charity organizations, XXVI, 114.
Law and Order Societies, XXVII, 556.
Societies for the Prevention of Cruelty to Children, XXVI, 151.
Almshouses, XXV, 144; XIX, 480.
Almsgiving in relation to Poor-laws, XIX, 477.
The Montyon Prizes (rewards for signal instances of philanthropy), XXVIII, 133.
Poor-laws, XIX, 476; XXVIII, 457.
English Poorhouses, XIX, 482.
Nursing, XXVIII, 266.
Hospitals, XII, 314.
Bellevue Hospital, XXV, 418.
Guy's Hospital, XXVII, 204.
Foundling Hospitals, IX, 425.
Ambulance Association, XXV, 157.
Ambulance, I, 584.
Tenement Life, XXIX, 247.

III. ANTI-SLAVERY LEADERS.

Abolitionists, XXII, 149; XXV, 28.
Abolition of slavery in the United States, XXIII, 800–804–807–817.
Abolition of slavery in the British colonies, VIII, 327 b.
Clarkson on slavery, V, 710.
The Quakers' opposition to slavery, XVIII, 507.
John Woolman, XXIX, 590.
President Jefferson's opposition to slavery, XIII, 625.
Emancipation in the United States, XXIII, 817.
William Wilberforce, XXIV, 596.
William Forster, XXVII, 9.
John Brown, IV, 346; XI, 438.
William Lloyd Garrison, X, 78; XVII, 445; XXII, 150.
Joshua R. Giddings, XXVII, 94.
Wendell Phillips, I, 634; XXVIII, 407.
Samuel May, XXVIII, 54.
Elijah P. Lovejoy, XXII, 150; XXVII, 636.
Owen Lovejoy, XXVII, 637.
James Russell Lowell, XXVII, 638.
Benjamin Lundy, XXVII, 644.
James G. Birney, XXV, 483.
Elizur Wright, XXIX, 605.
Anna Dickinson, XXVI, 414.
Harriet Beecher Stowe, XXIX, 169.
Henry B. Stanton, XXIX, 151.
John Greenleaf Whittier, I, 644.
John C. Frémont, XXVII, 36.
Abraham Lincoln, XIV, 665.
Frederick Douglass, XXVI, 442.
See also the following articles: History of Slavery, XXII, 137; Ancient Slavery, XIX, 361; the Slave-trade, XXII, 146; British and Foreign Anti-Slavery Society, XXV, 600; Freedmen's Bureau, XXVII, 33.

IV. REFORMS AND REFORMERS.

1. The Woman-Suffrage Movement.

The first convention in the United States to advocate Women's suffrage was held at Seneca Falls, N. Y., in 1848. Four women were present.

Elizabeth Cady Stanton, XXIX, 150.
Lucretia Mott, XXVIII, 152.
Lucy Stone, XXIX, 165.
Susan B. Anthony, XXV, 201.
Mary A. Livermore, XXVII, 612.
Antoinette Brown Blackwell, XXV, 495.
Amelia Bloomer, inventor of the "Bloomer costume," XXV, 509.
Emily Faithfull, XXVI, 613.
Millicent Garrett Fawcett, XXVI, 624.
Ellen H. Foster, XXVII, 14.
May Wright Sewall, XXIX, 66.
Women's clubs, XXVI, 205.
Education and enfranchisement of women, XXIX, 579.

2. The Temperance Movement.

Liquor laws, XIV, 694; XXVII, 605.
Temperance legislation, XIV, 694.

Prohibition laws, XXVII, 606.
Option laws, XXVII, 606.
South Carolina dispensary system, XXVII, 607.
The Gothenburg system, XXVII, 608.
Raines liquor law, XXVII, 607.
The Prohibition Party, XXVIII, 495.
Temperance societies, XXIII, 174.
Woman's Christian Temperance Union, XXIX, 581.
Temperance legislation in the United States, XXVII, 605.
Father Mathew societies, XV, 638.
Good Templars, XXIII, 175; XXVII, 608.
Theobald Mathew, XV, 638.
John B. Gough, XXVII, 131.
Frances E. Willard, XXIX, 554.

3. Social Reformers.

Felix Adler, founder of the Society for Ethical Culture, XXV, 49; XXVI, 591.
Charles Bradlaugh, English agitator and social reformer, XXV, 568.
Anthony Comstock, champion of social purity, XXVI, 246.
Elbridge T. Gerry, president of the Society for the Prevention of Cruelty to Children, XXVII, 88.
Society for Ethical Culture, XXVI, 591.

CHAPTER LVI

The Public Speaker

Mend your speech a little,
Lest it may mar your fortunes."—*King Lear.*

He who would excel as a public speaker must in the first place possess a thorough mastery of words. He must be able to express his thoughts in a manner which is, at the same time, pleasing, forcible, and convincing. He must have a minute and comprehensive knowledge of everything pertaining to the subject which he undertakes to discuss; and he must understand the secret influences and methods by which the minds of his hearers may be moved and their actions determined. A mastery of words and of correct and elegant language may be acquired by the study of rhetoric and its kindred branches (see Chapter LIX, entitled *The Writer*, in this Guide). A knowledge of the subject to be discussed must be obtained by careful investigation, by personal experience, and by the study of books. One's understanding of the human mind and its motives may be improved by the study of philosophy, and especially that division of the science which is usually called psychology (see the references in Chapter LVIII, entitled *The Teacher*, in this Guide).

Greek and Roman Oratory

Very much may be learned by studying the methods of famous orators of former times. Would you know the methods by which Demosthenes made himself the greatest orator of all time? and would you understand something of the distinctive qualities of his oratory? Read the article in the *Britannica*, VII, 63; then read of the characteristics of Greek oratory in general, XI, 127. Read of Antiphon, the most ancient of

Greek orators, II, 118; of Isæus, XIII, 386; of Hyperides, XII, 631; of Lysias, XV, 118; of Isocrates, XIII, 398; and of Andocides, II, 18.

Then see what is said about Roman oratory, XX, 738. Read of Cicero, V, 673, and XX, 528; of Hortensius, XII, 214; of Marcus Antonius, II, 123; of Domitius Afer, I, 203; of Julius Cæsar, IV, 562, and XX, 740.

British Oratory

Then, coming down to the oratory of modern times, read of Lord Chatham, V, 381; of Burke, IV, 486; of Richard B. B. Sheridan, XXI, 833; of Fox, IX, 441 a′; of the younger Pitt, XIX, 143; of Grattan, XI, 54; of Brougham, IV, 337; of Lord Derby, VII, 95; of Robert Hall, XI, 349. Finally, arriving at the study of our American orators, read I, 633, and I, 634. Then turn to the article on Patrick Henry, XI, 602; and afterward to those on Fisher Ames, I, 645; Daniel Webster, XXIV, 498; Henry Clay, V, 714; John C. Calhoun, IV, 606; Edward Everett, VIII, 646.

American Oratory

The rules that govern argumentative bodies should be thoroughly understood by every public speaker. Hence refer to

Parliamentary law, XXVIII, 336.

Parliamentary procedure, XVIII, 317.

Quorum, XXVIII, 528.

Once started in this course of reading, you will be surprised at the large number of additional subjects which will suggest themselves; and if you are in earnest you will need no guide to point out their whereabouts in the *Britannica*. You will be able to depend upon and help yourself.

As an example of the manner in which a single subject may be studied with a view to its discussion in public, let us suppose that we are preparing a lecture on temperance. What help can the *Encyclopædia Britannica* give you? Let us see. That the wisest of ancient philosophers advocated temperance, see XXII, 249, and II, 591; and that they declared it to be one of the cardinal virtues, see VIII, 511.

The Temperance Lecturer

Read of Bacchus, VII, 216, and XVII, 863.

Then, coming to later times, study the valuable article on Drunkenness, VII, 416; also Liquor Laws, XIV, 694, and XXVII, 605; Temperance Societies, XXIII, 174; Good Templars, XXIII, 175.

Prisons, XIX, 766.

Poorhouses, XIX, 482.

Other articles and sections which may be read at pleasure are:

Theobald Mathew, XV, 638.

John B. Gough, XXVII, 131.

Neal Dow, XXVI, 443.

Prohibition laws, XXVII, 606.

Option laws, XXVII, 606.

South Carolina dispensary system, XXVII, 607.

The Gothenburg dispensary plan, XXVII, 608.

Raines liquor law, XXVII, 607.

Prohibition Party, XXVIII, 495.

Father Mathew societies, XV, 638.

Woman's Christian Temperance Union, XXIX, 581–82.

Alcoholic beverages, XXV, 123.

Distillation of spirits, VII, 229.

Brewing, IV, 236; fermentation, XXIV, 633.

Brewing in the United States, XXV, 584.

Brandy, IV, 194.

Whisky, XXIV, 572.

Effects of whisky, XVIII, 417.

Wine, XXIV, 633.

Ale, I, 421

Absinthe, I, 57.
Arrack, II, 549.
Gin, X, 537.
Liqueurs, XIV, 692.
Perry, XVIII, 568;
and in like manner through the entire list of intoxicating beverages. To these may be added such articles as

The Keeley Gold-cure, XXVII, 482.
Delirium tremens, VII, 45.
Insanity, XIII, 101; in relation to crime, VI, 517.
Heredity, I, 82; IV, 219; VIII, 534; XIII, 102; and XXVII, 275.

The list of books and other publications which advocate the cause of temperance, XXIII, 175, will be found of much value in directing you to further research.

So much for the lecturer on temperance. The political speaker will find a selection of references for his special use in Chapter XLII, entitled *The American Citizen;* the pulpit orator will find an extensive array of references in Chapter LIV, entitled *The Preacher and Theologian;* and, generally speaking, the various subjects adapted to public presentation and discussion receive due notice in this GUIDE, each under its special heading. Hence it is unnecessary to multiply examples here.

Other Speakers

The would-be orator, however, no matter what may be his theme, is recommended to follow out the course of reading suggested in Chapter LIX, entitled *The Writer.*

CHAPTER LVII

THE BOOKMAN

"Come, and take choice of all my library."—*Titus Andronicus.*

"We turned o'er many books together."—*Merchant of Venice.*

To THE lover of books the *Encyclopædia Britannica* is itself a great and inestimable treasure, the companion of leisure hours, the helper in time of need, the one indispensable portion of his library. No other single collection of volumes in the world furnishes so complete an equipment for all the business of life. Without the *Britannica* no scholar's library is complete; without it no bookman's house can be fully furnished. It is not only in itself a book to be consulted and admired and cherished, but it is rich in information concerning other books that deserve to be admired and cherished. It is *par excellence* the bookman's book about books.

The Book Lover

Would you like to learn something about the greatest books the world has ever produced—something about the character of their contents—something about their origin?

The following list of references will help you to find the information you desire:

ONE HUNDRED GREAT BOOKS.

The Bible, III, 548; XXV, 449.
The Vedas, II, 610; Rig-Veda, XII, 820.

Mahabharata, XXI, 294.
Ramayana, XXI, 294.
Sakuntala, XIII, 838 a.'''
Shah-Namah, XVIII, 669; IX, 196.
Zend Avesta, XXIV, 814.
The Koran, XVI, 619.

Homer's Iliad, XII, 120.
Homer's Odyssey, XII, 122.
Aristotle's Ethics, and Politics, I, 194; XIX, 362.
Demosthenes on the Crown, VII, 63.
Æschylus's Tragedies, I, 188.
Sophocles's Œdipus, XXII, 285.
Euripides's Medea, VIII, 592.
Aristophanes's The Knights, II, 447.
Herodotus, XI, 676.
Xenophon's Anabasis, I, 690.
Plato's Dialogues, XIX, 205–23.
Cicero's Orations, XX, 528; V, 673.
Lucretius's *De Rerum Natura*, XV, 52–57.
Virgil's Æneid, XXIV, 267.
Plutarch's Lives, XIX, 243; XVII, 344.
Epictetus's Enchiridion or Manual, VIII, 418–19.
Lucian's "True History," XV, 45.
Marcus Aurelius's Meditations (or Reflections, or Thoughts), III, 76–78.

The Eddas, VII, 563; XXII, 212.
Nibelungenlied, XVII, 487.
The Kalewala, IX, 191–92.
Gesta Romanorum, X, 496.
Malory's Morte d'Arthur, XV, 340; X, 155.
Arabian Nights, XXIII, 336.
Froissart's Chronicle, IX, 704.

Dante's Divina Commedia, VI, 717.
Petrarch's Canzoniere, XVIII, 724.
Chaucer's Canterbury Tales, V, 392.
Ariosto's Orlando Furioso, II, 443.
Spenser's Faërie Queene, XXII, 409.
Tasso's Jerusalem Delivered, XXIII, 82 b."

Camoens's The Lusiad, IV, 661–62.
Shakespeare's Tragedies, VII, 371.
Molière's Comedies, XVI, 646–53.
Milton's Paradise Lost, XVI, 348–51.
Bunyan's Pilgrim's Progress, IV, 473.
Byron's Childe Harold, and Don Juan, IV, 540–43.
Tennyson's In Memoriam, XXIX, 252.

Machiavelli's The Prince (*Principe*), XV, 150–51, 153.
More's Utopia, XVI, 843, 845.
Hobbes's Leviathan, VIII, 376; XII, 37–42.
Descartes' *Principia Philosophiæ* (Principles of Philosophy), VII, 104–11.
Spinoza's Ethics, XXII, 416–19.
Locke On the Human Understanding, VIII, 379.
Newton's Principia, XVII, 454–59.
Laplace's *Mécanique Céleste*, and *Système du Monde*, XIV, 301–02.
Smith's Wealth of Nations, XIX, 378.
Kant's Critique of Pure Reason, XIII, 854–64.
Gibbon's Decline and Fall of the Roman Empire, X, 516.
Boswell's Life of Dr. Johnson, IV, 69.
Mill's Logic, XVI, 324.
Darwin's Origin of Species, XXIV, 84.
Spencer's First Principles, XXIX, 137.

Boccaccio's Decameron, III, 734.
Rabelais's Gargantua, XX, 203–05.
Don Quixote, V, 306.
Gil Blas, XIV, 472.
Robinson Crusoe, VII, 26.
Gulliver's Travels, XXII, 804.
Prévost's Manon Lescaut, XIX, 739–40.
The Vicar of Wakefield, X, 678.
Voltaire's Zadig, XXIV, 313 a.
St. Pierre's Paul and Virginia, XXI, 205–06.
Fielding's Tom Jones, IX, 128 a.'''

Sterne's Tristram Shandy, XXII, 569–71; VIII, 383 b.'''

Lessing's Nathan the Wise, and Laocoon, XIV, 480–82.

Goethe's Faust, X, 482.

Fouqué's Undine, IX, 429–30.

Chateaubriand's René, V, 378.

The Waverley Novels, VIII, 386.

Balzac's *Comédie Humaine*, III, 262–63.

Dumas's Monte Christo, VII, 450 b.''

Victor Hugo's *Les Misérables*, XXVII, 336.

Thackeray's Vanity Fair, XXIII, 234.

Dickens's David Copperfield, VII, 153.

Charlotte Brontë's Jane Eyre, IV, 329.

Hawthorne's Scarlet Letter, XI, 480 b.'

Mrs. Stowe's Uncle Tom's Cabin, XXV, 165.

George Eliot's Romola, XXVI, 318.

St. Augustine's Confessions, III, 66; VIII, 521; I, 195.

Thomas à Kempis's Imitation of Christ, XIV, 33.

Pascal's Pensées, XVIII, 341 a.'

Jeremy Taylor's Holy Living and Holy Dying, XXIII, 100; VIII, 376.

Hooker's Ecclesiastical Polity, XII, 154.

Bacon's Essays and Novum Organum, III, 182; VIII, 376.

Sir Thomas Browne's *Religio Medici*, and Urnburial, IV, 350–51.

Rousseau's Confessions, XXI, 31–33.

De Quincey's Confessions of an English Opium-Eater, VII, 89.

Richter's Titan, XX, 562.

Lewes's History of Philosophy, XIV, 491; VIII, 670.

Addison's The Spectator, I, 136; VIII, 380.

Strauss's Life of Jesus, XXII, 620–21.

Renan's Life of Jesus, XXVIII, 573.

Macaulay's Essays, XV, 127.

Emerson's Essays, XXVI, 568.

Carlyle's French Revolution, XXVI, 65.

Keble's Christian Year, XIV, 27.

We have named more than one hundred. The list might be extended, but it is unnecessary.

SOME BOOKISH SUBJECTS.

Album, I, 403.

Aldine — Aldus Manutius, XV, 519.

Almanacs, I, 519.

Ancient forms of books, XVIII, 148.

Anonymous, III, 569.

Alexandrian MS., I, 438.

Bibliography, III, 563–74.

Bibliomania, III, 566; XXV, 464.

Bindings, IV, 36; XIV, 538; the "Arminian Nunnery," XXVI, 632.

Block-books, III, 564; XXIII, 725.

Black-letter, XXIII, 739.

Books, IV, 33; III, 563.

Book-cases, XIV, 537.

Book-louse, XIII, 159.

Book-plates, XXV, 543.

Book-scorpion, XXV, 544.

Books for the Blind, XXV, 503.

Books in the British Museum, XXV, 601.

Bowdlerizism, XXV, 560.

Broadsides, XVIII, 208.

Catalogues, XIV, 537, 540.

Copyright, XIV, 542. See also Chapter LXI, entitled *The Printer and Publisher*.

Censorship of books, III, 569; IV, 35.

Chap-books, XVIII, 208.

Classification of books, III, 572.

Cleaning of books, III, 713.

Condemned and prohibited books, III, 569–70. See also Index Expurgatorius, below.

De Morgan's Bibliography, VII, 59.

Dibdin, VII, 149.

Dictionaries, VII, 155–68; XXVI, 415.

Duyckinck's Cyclopedia of Literature, XXVI, 472.

Egyptian books, XIV, 509.

Folk-books, XVIII, 208.

CHAPTER LVIII

The Teacher

"The true university of our day is a collection of books."
— *Thomas Carlyle.*

The Teachers' Book

Valuable as the *Encyclopædia Britannica* is to persons of all callings and professions, there is no one who can derive greater benefit from it than the teacher. To the man or woman actively engaged in education, its worth is beyond all estimation. It is an exhaustless mine of knowledge, offering information on every imaginable subject. It is an obliging friend, answering accurately the thousands of perplexing questions that are daily and unexpectedly presented. It is the teacher's *vade*

mecum, the indispensable companion to which he turns for help and guidance in every time of need. If one were asked to point out the articles of greatest value to the educator, he could not answer; he could only say, "All are valuable." To the teacher of science, the articles on scientific subjects will be referred to most frequently (see the references on pp. 54–79 of this GUIDE). The teacher of mathematics will derive aid from the numerous chapters and treatises on mathematical subjects (see pp. 74–76). And so, whether you are a teacher of geography, or of philosophy, or of literature, or of history, or of music, or of art, or of any other department of human knowledge, you will find the *Britannica* always ready to supplement your instruction, and to aid you in the work which you have in hand.

This is the day of educated teachers —of teachers who are learned not only in the branches which they teach at school, but in the principles which underlie the practice of their calling. Pedagogy has become a distinct science. School-teaching is no longer a haphazard business; it is a profession conducted on lines as exact as those which determine the practice of law or of medicine or of theology. The teacher who neglects or refuses to recognize this fact is already on the road to failure, and his successor is knocking at the door.

Pedagogy

In the present chapter it is proposed to mark out two or three brief courses of professional reading for teachers— courses which may be pursued at odd moments at home, and which will in no small measure take the place of similar courses of study in teachers' institutes and normal colleges. The teacher who follows them out faithfully will be not only better equipped for examinations, but possessed of a broader and deeper knowledge of his profession, and consequently much better prepared to grapple with its difficulties and avoid its perplexities.

I. HISTORY OF EDUCATION.

Let us take as the starting-point and basis of this course of reading the article EDUCATION, in the seventh volume of the *Britannica*. This article, which covers eight double-column pages (582–91), is the work of Oscar Browning, of Cambridge University, well known in this country for his work on Educational Theories. The object of the article is mainly to outline the history of educational theories in the chief crises of their development, and no attempt is made to discuss the science of teaching or to describe the practical working of any particular method or theory. Let us, then, study the history of education from the following references:

Education in Greece and Rome

Old Greek education, VII, 582.
Plato, XIX, 205.
Old Roman education, VII, 582.
Quintilian, XX, 193, 528.
Early Christian education, VII, 582.
Clement, V, 715.
Origen, XVII, 863.
Tertullian, XXIII, 213.
Augustine, III, 66.

Education in the Middle Ages, VII, 582.

See also Knighthood, XIV, 112.

The Middle Ages

Charlemagne, V, 349.
Alcuin, I, 417.
Bede, III, 415.
John Scotus Erigena, VIII, 462.
Gerhard Groot, XI, 185.
Thomas à Kempis, XIV, 33.

Brethren of the Common Life, XVI, 737.

Education at the time of the Renaissance, VII, 583.

See also Erasmus, VIII, 453.

Luther, XV, 73.

Melanchthon, XV, 842.

Twelve famous teachers:

Sturm (1507–89), VII, 584.

Famous Teachers

Roger Ascham (1515–78), II, 592.

Comenius (1592–1671), VI, 162.

Ignatius Loyola, XV, 32.

Arnauld, II, 542.

Pascal, XVIII, 339.

August Hermann Francke, IX, 617.

Pestalozzi, VII, 587.

Froebel, IX, 695.

Jacotot, XIII, 549.

Thomas Arnold, II, 547.

Horace Mann, XV, 499.

Lindley Murray, XXVIII, 162.

Mary Lyon, XXVII, 651.

James B. Angell, XXV, 192.

Writers on Education:

Roger Ascham ("The Scholemaster"), II, 592.

Books and Writers

Montaigne, XVI, 793; VII, 585.

John Locke, XIV, 758.

John Milton ("Tractate on Education"), XVI, 336.

The Port Royalists, XIX, 548.

Rousseau ("Émile"), XXI, 31.

Pestalozzi ("Leonard and Gertrude"), VII, 587.

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II. EDUCATIONAL INSTITUTIONS IN THE OLD WORLD.

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This extensive article exhibits the universities in their historical development, each being brought under notice, as far as practicable, in the order of its original foundation.

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Cambridge University, III, 499; IV, 644–47; XXIII, 893.

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III. EDUCATION IN THE UNITED STATES.

A comprehensive and exceedingly interesting article on the history of

HIGHER EDUCATION IN THE UNITED STATES is contained in XXVI, 489–95. This article is the work of Dr. B. A. Hinsdale, of Michigan University, and should be read not only by every American teacher, but by every person who would be informed concerning the progress of education and of educational ideas in this country. It is a worthy companion article to the very complete history of UNIVERSITIES, XXIII, 887.

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Statistics showing the number of colleges and universities in each State in 1840, XXVI, 492.

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IV. EDUCATION IN VARIOUS COUNTRIES.

Generally a full account of the educational institutions of any country may

be found in the article referring to the country in question.

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V. PSYCHOLOGY.

The article on PSYCHOLOGY, by Professor James Ward, of Trinity College, Cambridge (Volume XX), fills nearly fifty pages of the *Britannica*, and contains more matter than the ordinary school textbooks on that subject. The teacher who cares to go so deeply into the study as to master this entire treatise will probably not desire a more extended course of reading. It may be preferable, however, to read only selected portions of the article, and to supplement the knowledge thus gained with collateral readings from other sources. In such case the following subjects may be included: Definition, p. 42; standpoint of psychology, p. 43; constituent elements of mind, p. 44; feeling, p. 45; attention, p. 46; dependence of action on feeling, p. 48; relativity, p. 54; sensation and movement, p. 55; perception, p. 56; intuition of things, p. 60; imagination or ideation, p. 62; obliviscence, p. 66; expectation, p. 68; feeling, p. 71; intellection, p. 79, etc.

Science of Mind

Evolution of mind, VIII, 673.
Association of Ideas, II, 638–42.
Mental powers of man, II, 96.
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Locke on this subject, XIV, 764.
Faculties of perception, XVIII, 859.
Kant on imagination, XIII, 861.
Mnemonics — memory, XVI, 556.
Optimism and pessimism, XVIII, 698.

The following biographical notes should also be read:

Great Psychologists

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Bishop Berkeley, III, 508.
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Schopenhauer, XXI, 478.
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Samuel Bailey, III, 208.
G. H. Lewes, XIV, 490.
Herbert Spencer, XXIX, 136–39.
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VI. THEORIES OF EDUCATION.

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Theories of Education

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Brethren of the Common Life, XI, 185.
Theories of Erasmus, VII, 583; VIII, 453.
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Theories of Comenius, VI, 162; VII, 584.
Locke's, XIV, 763.
Milton's, XVI, 342.
The Jesuits' theory, XIII, 656.
The Port Royalists', XIX, 548.
Rousseau's, VII, 586.
Richter's, VII, 587 b.″
Goethe's, VII, 588 a.
Pestalozzi's, XIV, 81; XXII, 836.
Froebel's, IX, 695.
Herbart's, XIV, 803.
Herbert Spencer's, VII, 588 a″; XXIX, 138.
Alexander Bain's, VII, 588 b.′

CHAPTER LIX

The Writer

"Certainly, the art of writing is the most miraculous of all things man has devised." — *Thomas Carlyle.*

"There are two duties incumbent upon any man who enters on the business of writing — truth to fact, and a good spirit in the treatment." — *Robert Louis Stevenson.*

I. PENMANSHIP AND ITS ALLIED ARTS.

First, as to the manual exercise of penmanship, what is there in the *Britannica* which commends itself to the writer, or to him who is interested in the art of writing? Let us see.

Writing Materials

Without implements and materials there can be no writing. The history of these and the description of their manufacture cannot fail to be of interest.

Read the article Pen, XVIII, 493, which is full of interesting details concerning the manufacture of modern steel pens; Ink, XIII, 86; then an account of the invention of paper, IV, 34; of its invention by the Chinese, V, 575, of the uses made of it in ancient times, XVIII, 148; and finally, the special article, Paper, XVIII, 221. Read also of Papyrus, XVIII, 235; and of Parchment, XVIII, 276; XIV, 390; and IV, 34. The earliest writing materials are described in XVIII, 235.

Handwriting

A concise history of the art of writing may be found in XXIX, 606. The history of ancient handwriting is related in a very interesting article on Palæography, XVIII, 147–70; the ancient system of Hieroglyphics, XI, 709; Cuneiform Writing, VI, 624, and XI, 193; Mexican picture writing, XVI, 220; Chinese writing, V, 567–72; Sanskrit, XXI, 282–86.

A comprehensive history and description of the Alphabet is given in I, 527–40.

The alphabets of different nations also receive separate notice. For example:

The Phœnician, XI, 722, and XVIII, 815, 819; Egyptian, XI, 722; Greek, XII, 115; Roman, XIII, 131; Sanskrit, XXI, 282; the Old Norse Runes, XXI, 382, 386.

The deaf and dumb alphabet is described in VII, 5; the phonetic method in XVIII, 824, and XXII, 396; and the phonographic in XXI, 875.

See also ARCHÆOLOGY, II, 299, and Chapter LX in this GUIDE, entitled *The Stenographer and Typewriter.*

II. COMPOSITION AND RHETORIC.

Composition

The mental processes of writing are closely related to the various branches of language study, such as grammar, rhetoric, prosody, etc. Hence the inquiry may be made, "What are the principal articles in the *Britannica* which will be interesting and useful to the busy man who wishes to acquire correctness and facility in English composition?" Let us briefly notice a few.

Rhetoric

The special article RHETORIC, XX, 523, is interesting and comprehensive, and in large part historical. Notice the section on rhetoric in ancient Greece, XX, 523; that on rhetoric in the Middle Ages, XX, 529; and that on modern writers on rhetoric, XX, 530.

Still pursuing the history of this subject, read the notice of Aristotle's rhetoric, II, 454; of Lysias's, XV, 118; and of Quintilian's, XX, 193. Read also the brief account of Whately's famous work, XXIV, 559.

Being fairly introduced into this study, you are now prepared to consult the *Britannica* for the large number of separate articles relating to the terms, expressions, and rules of rhetoric and its kindred branches of study. Here are some that are found in the first two volumes; they are mentioned simply as examples, trusting that the reader will be able to find all other articles of the kind without further directions:

In Volume I. Acrostic, Alcaics, Allegory, Alliteration, Alexandrine Verse, Anacoluthon, Anachronism, Anagram, Abbreviations, etc.

In Volume II. Anecdote, Anticlimax, Antithesis, Antonomasia, Aphorism, Apologue, Apothegm, etc.

In the later E. B. volumes many additional articles may be found, such as:

Blank Verse, XXV, 501.
Climax, XXVI, 200.
Apostrophe, XXV, 211.
Hexameters, XXVII, 284.
Prosody, XXVIII, 501.

By observing the list of terms and expressions used in any text-book on rhetoric, you may complete this list; and then, by finding the various articles in the *Britannica*, you will observe how much more fully they are treated there than in any of the smaller manuals.

Grammar

The article GRAMMAR, XI, 34, belongs rather to the philologist than to the writer, and more to the student than to the busy man. The section on school grammars, XI, 39, is interesting, and well worth your reading.

Every writer will find certain articles in the *Britannica* very valuable for reference in case of any dispute or lapse of memory regarding best usage, etc. For example, the articles on ABBREVIATIONS, I, 31, and XXV, 17, contain a correct list of all the more common abbreviations used by reputable writers. The latter article is very complete. It is followed by a list of Abbreviatory Signs, XXV, 22, showing the marks and symbols employed in commerce and in the various arts and sciences. A list of Forms of Address employed in letter-writing is given in XXV, 46.

The methods pursued in correcting printers' proofs are fully explained in XXVIII, 497. If the date of any important event has been forgotten, it may very likely be found by referring to the CHRONOLOGICAL TABLE, V, 625. In short,

the *Britannica* is always ready to aid one's memory, and to no other person does it give more assistance in this way than to the writer.

But, after all, it is chiefly through the study of the works of the best writers that one can hope properly to improve his own style, and to acquire facility and elegance in the use of language. Hence the busy writer is urged to make a special study of the references in Chapter VII, entitled *Five Courses of Reading in the History of Literature*, in this GUIDE, also Chapter LVI, entitled *The Public Speaker*.

III. ONE HUNDRED SUBJECTS FOR ESSAYS.

The following list is designed chiefly to aid teachers and pupils at school in the selection of subjects for essays, some of the materials for which may be acquired through the systematic study of certain articles in the *Encyclopædia Britannica*. A good rule, which every writer should attempt to observe, is this: "Never undertake to write upon any topic until you have made a careful study of that topic. Store your mind with knowledge, so that your writing will be the visible expression of your thoughts. Always have something to say before you attempt to write or to speak." The various references mentioned or pointed out will indicate some of the places in the *Britannica* where information regarding those subjects may be found. These are intended only as hints, and are not designed to relieve the student from the very necessary labor of independent research.

Subjects for Essays

1. Temperance. See the references given in Chapter LVI, entitled *The Public Speaker*.

2. The Wonders of Electricity. See VIII, 4; XV, 784; XX, 260. The references in Chapter XXVI, for *The Electrician*, in this GUIDE, will be helpful.

3. Ancient Oratory. See the references to famous speakers, in Chapter LVI, entitled *The Public Speaker*.

4. American Poetry. Study the portion of the article on AMERICAN LITERATURE which deals with Poetry, I, 641–44. Read also the biographical sketches of the great American poets: Henry W. Longfellow, XIV, 870; John G. Whittier, XXIX, 545; William Cullen Bryant, XXV, 625; James Russell Lowell, XXVII, 638; Edgar Allan Poe, XIX, 267; Walt Whitman, XXIX, 544.

5. True Greatness in Man. See biographical sketches of such men as Joseph, XIII, 759; Moses, XVI, 888; Confucius, VI, 229; Buddha, III, 323, also Vol. IV, 381; Elijah, VIII, 126; Socrates, XXII, 244; Cato, V, 208; Marcus Aurelius, III, 75–78; Charlemagne, V, 349; King Alfred, I, 447; St. Louis, XV, 20; Savonarola, XXI, 349; Galileo, X, 28; William the Silent, XXIV, 614–15; John Milton, XVI, 336; George Washington, XXIV, 408; and many others.

6. The Earth. See the references in Chapter XIII, entitled *Readings in Geography*, in this GUIDE.

7. Mountains. Refer to special article, XVII, 10.

8. The Ocean. Water of, XXI, 641; waves, XXIV, 440; depths, III, 17; temperature, VI, 6; tides, XXIII, 375; fishes, XII, 722.

9. Great Cities of the World. See London, XIV, 827; Paris, XVIII, 278; New York, XVII, 462; Berlin, III, 512; and others that will readily be suggested. Consult the Index volume.

10. Ships and Sailors. See Chapter XXXIX in this GUIDE, entitled *The Seaman.*

11. Progress of Inventions. See, in this GUIDE, the readings in "Archæology and Antiquities," pp. 81–83; also Chapter XXVII, entitled *The Inventor.*

12. The Steam-Engine. Consult the Index volume; also Chapter XXV in this GUIDE, entitled *The Machinist.*

13. War and Peace. Refer to Chapter XLI, entitled *The Soldier.* See International Peace, XIII, 203 a. Consult the Index volume.

14. Slavery. See the special article, XXII, 137; also ancient slavery, XIX, 361; Negro, XVII, 325. Consult Index volume. Read about Wilberforce, XXIV, 595; Clarkson, V, 710; Garrison, X, 78; Wendell Phillips, XXVIII, 407; John Brown, IV, 346; and the anti-slavery leaders named in Chapter LV, entitled *The Philanthropist and Reformer*, p. 200.

15. Socialism. See the special article on SOCIALISM, XXII, 216. Consult Index volume; also the references under 7. Coöperation, on pp. 164–65 of this GUIDE. Read about Robert Owen, XVIII, 90; Fourier, IX, 432; Saint-Simon, XXI, 207; Rodbertus, XX, 632; Proudhon, XIX, 892; the Shakers, XXI, 773; the Oneida Community, XVII, 794; Labor Organizations, XXVII, 526.

16. Taxation. See references in this GUIDE, in the section on Public Finance, on pp. 169–70 of Chapter XLV, entitled *The Banker and Financier.*

17. The Origin of Language. See VIII, 673. Consult Index volume under the headings Language and Philology. See references in this GUIDE, in Chapter VIII, entitled *Readings in Philology and the History of Language.*

18. Land Tenure. See special articles on LAND, XIV, 260–71, and on LANDLORD AND TENANT, XIV, 273–78. Consult Index volume. See Adam Smith, XIX, 380; Ricardo, XIX, 386; Henry George, XXVII, 78.

19. Law in Ancient Times. Consult the references in Chapter XLVIII, entitled *The Lawyer*, p. 174.

20. Feudalism. See the special article on FEUDALISM, FEUDAL SYSTEM, IX, 105–08. Consult Index volume. See Knight, XIV, 112; Castle, V, 171; Tournaments, XXIII, 520; Chivalry (Index volume, p. 194); Homage, XII, 110, etc.

21. The Revival of Learning. See Renaissance, XX, 392. Consult Index volume.

22. The Art of Printing. See references in Chapter LXI, entitled *The Printer and the Publisher*, in this GUIDE.

23. Newspapers. See references in Chapter LXII, entitled *The Journalist.*

24. Perseverance Leads to Success. For illustrations of this truth, see the biographical references in this GUIDE, pp. 25–29.

25. Education in Greece and Rome. See the references in Chapter LVIII, entitled *The Teacher.*

26. Great Educators. See the references in Chapter LVIII, entitled *The Teacher.*

27. The Science of Education. See the references in Chapter LVIII, entitled *The Teacher.*

28. Famous Institutions of Learning. See the references in Chapter LVIII, entitled *The Teacher.*

29. The Progress of Medical Science. See the historical and biographical references in Chapter L, entitled *The*

Physician, in this GUIDE. Consult Index volume.

30. Music and Musicians. See the references in Chapter LXIV, entitled *The Musician*, in this GUIDE.

31. The Discovery of America. See VI, 155; X, 161; XI, 153; Icelandic discoveries, XII, 660; early knowledge of, X, 159; original inhabitants, XVI, 214; origin of name America, X, 162, and XXIV, 208. See also references in Chapter VI of this GUIDE, entitled *Three Courses of Reading in History*.

32. Great Americans. See the references in Chapter III, entitled *Home Readings in Biography*, in this GUIDE.

33. Washington and Lafayette. Consult Index volume. See references to great Americans, above.

34. Hamilton and Burr. See XI, 368; XXIII, 793; XIX, 397; XI, 369; XXV, 655.

35. Great American Orators. See the biographical references in Chapter LVI, entitled *The Public Speaker*.

36. The Invention of the Telescope. Consult Index volume.

37. The Telegraph and the Telephone. See the references in Chapter XXVI, entitled *The Electrician*, in this GUIDE.

38. Astrology. See the references given, in this GUIDE, in Chapter IX, entitled *Readings in Astronomy*, p. 55; and in Chapter XXI, entitled *Readings in the Study of the Supernatural*, p. 95.

39. The Philosopher's Stone. See the references given, under *Alchemy*, in this GUIDE, p. 95.

40. The Progress of Chemistry. See special article, V, 397; also XXVI, 130–39. Consult Index volume.

41. The Air We Breathe. See I, 379; III, 26–33. Consult Index volume; also see Atmosphere, Oxygen, Respiration, Ventilation, Asphyxia.

42. Water and Its Uses. See XXIV, 420–22, 424–32. Consult Index volume.

43. Curious Facts About Trees. See the references in Chapter XXXV, entitled *The Woodsman*.

44. The Solar System. See the references on pp. 55–56 of this GUIDE.

45. The Moon. See XVI, 825–29. Consult the Index volume.

46. The Worship of the Sun. By the Greeks, II, 162; by the Phœnicians, XVIII, 815; by the Sabæans, XXIV, 778; at Heliopolis, XIX, 100; at Baalbec, III, 153.

47. The Fire-Worshipers. See XXIV, 209; XVII, 164; XI, 605; XVIII, 330–33; XIX, 830.

48. The American Indians. See I, 602–19; XII, 862–73; XXVII, 374–82. Consult Index volume.

49. African Explorations. Consult Index volume.

50. The Arctic Regions. See II, 422; XIX, 327; X, 170; IX, 634–35.

51. The Gulf Stream. Consult Index volume.

52. Great Cities. See the references on pp. 71–72 of this GUIDE.

53. Our Government. See the references in Chapter XLII, entitled *The American Citizen*.

54. Monarchy. Consult Index volume; also references on p. 151 of this GUIDE.

55. The Mongol Races of Asia. See XVI, 767–78. Consult Index volume.

56. China and Japan. Consult Index volume.

57. Buddha and Buddhism. See IV. 381–92. Consult Index volume.

58. Missions. See XVI, 535–40; also the references on pp. 198–99 of this GUIDE.

59. Idolatry. See XII, 737, 749.

60. Mohammedanism. See XVI, 568–628. Consult Index volume.

61. The Jews. See XI, 531–38; XIII, 406–41, 690–98. Consult Index volume. See also Chapter XIX in this GUIDE, entitled *Readings for Bible Students.*

62. The Gipsies. See X, 545–52. Consult Index volume.

63. The Moors in Spain. See I, 234–35. See, in Index volume, the following subjects: Spain, Arabs, Moors, Alhambra, Granada, Ferdinand and Isabella.

64. The Turks. Consult Index volume.

65. The Battle of Hastings. See the following subjects in Index volume: William the Conqueror, Normans, Harold, Hastings, Battle.

66. Trial by ordeal. See XVII, 842.

67. Trial by jury. See XIII, 793–97. Consult Index volume.

68. The Knights Templars. See XXIII, 175–81. See also Templars, in Index volume.

69. Poetry. See XIX, 269–85; XXV, 164–67. Consult Index volume.

Consult Index volume, and also this GUIDE, for valuable references to the following subjects:

70. Chaucer, the father of English poetry.

71. Dante and Milton.

72. Shakespeare's Dramas.

73. The Greek Drama. See VII, 349–54; XI, 125–26; also references on pp. 229–30 of this GUIDE.

74. Pope and Dryden.

75. Addison and the Spectator.

76. Dr. Samuel Johnson.

77. Dictionaries. See VII, 155–68; also the references in Chapter LVII, entitled *The Bookman*, in this GUIDE.

78. History of Agriculture. See Chapter XXXII, entitled *The Farmer*, in this GUIDE.

79. Patents. See Chapter XXVII, entitled *The Inventor*, in this GUIDE.

80. Copyright. See Chapter LXI, entitled *The Printer and the Publisher*, in this GUIDE.

81. Books and How They Are Made. See Chapter LXI, entitled *The Printer and the Publisher*, in this GUIDE.

82. On Costume.

83. On Commerce. See also Chapter XLVI, entitled *The Merchant and Trader.*

84. On Exercise. See Athletic Sports, Health, Gymnastics, Calisthenics, etc.

85. On Games and Amusements. See also Chapter V, entitled *Games, Sports, and Pastimes.*

86. Domestic Animals. See Horse, Dog, Cat, Sheep, etc.; also the references on p. 30 of this GUIDE.

87. The Animal Kingdom. See the readings about animals, pp. 29–31 of this GUIDE.

88. Labor and Capital. See the references in Chapter XXXI, entitled *The Laborer*, in this GUIDE; also XXIII, 531.

89. Great Guns. See the references in Chapter XLI, entitled *The Soldier*, in this GUIDE.

90. Invention of Gunpowder.

91. War. See also Chapter XLI, entitled *The Soldier*, in this GUIDE, pp. 145–50.

92. Stories of Old Greece. See *Legends*, pp. 91–93 of this GUIDE.

93. Myths of the Old World. See the references on pp. 90–94 of this GUIDE.

94. The Greatest Books. See the references in Chapter LVII, entitled *The Bookman*, pp. 203–05.

95. The World's Great Thinkers. See the biographical references on pp. 83–86 of this GUIDE.

96. Great Reformers. See references on pp. 198–201 of this GUIDE.

97. The Work of the Farmer. See Chapter XXXII, entitled *The Farmer*.

98. Famous Merchants. See references on p. 172 of this GUIDE.

99. The Trade of the World. See references on pp. 170–72 of this GUIDE.

100. Superstition. See pp. 94–96 of this GUIDE.

CHAPTER LX

THE STENOGRAPHER AND TYPEWRITER

"For your writing and reading, let that appear when there is no need."
—*Much Ado About Nothing.*

THE successful stenographer and typewriter should be a person of many accomplishments. He should, in the first place, be a thorough master of the art of shorthand writing, alert in mind, quick with the hand, accurate, ingenious. In the second place, he should understand thoroughly the construction and manipulation of the type-writing machine, should be a good speller, should know how to punctuate correctly and when to use capital letters, and should have a practical acquaintance with the rules of English grammar and composition and with the forms to be observed in letter-writing. Besides all this, a general knowledge of business forms and methods is often of great benefit, sometimes indispensable. If, in addition to all these qualifications, the stenographer has at command a stock of information regarding history, politics, the sciences, and the arts, he may be quite sure that he will never want for a good position and a comfortable salary.

Qualifications

Young men and young women who are obliged to help themselves to an education of this kind will find no surer guide than the volume which they now hold in their hands; they will find no better or more trustworthy assistant than the *Encyclopædia Britannica*. As regards that sort of general education to which we have just alluded, let the student of stenography and type-writing consult the references named in various chapters of this GUIDE—for example: the *Three Courses of Reading in History*; the *Readings in Geography*; the *Two Courses of Reading in Physics*; *The Builder*; *The American Citizen*; *The Lawyer*; *The Merchant and Trader*; *The Banker and Financier*, etc. As regards the special kind of knowledge which is indispensable to the

General Information

practice of his art, he will find much that is helpful and instructive in such articles as the following:

History of the English language (modern), VIII, 357–60.

Language

Phonetics, XVIII, 824.

Phonetic spelling, XVIII, 825.

Speech sounds, XXII, 396.

Alphabet, I, 527.

Abbreviations, I, 31, and XXV, 17.

Abbreviatory signs, XXV, 22.

Tachygraphy, or ancient systems of shorthand, XVIII, 168.

Shorthand in English-speaking countries, XXI, 875.

Shorthand

The a b c systems, XXI, 875.

Pitman's phonography, XXI, 877–79.

Foreign shorthand systems, XXI, 880.

Sir Isaac Pitman, XXI, 875; XXVIII, 436.

Benn Pitman, XXVIII, 435.

Parliamentary reporting, XXI, 880.

Forms of address in letter-writing, XXV, 46.

Type-writers, XXIX, 346–48.

Type-writing machines, XXIV, 733.

CHAPTER LXI

The Printer and the Publisher

"Once invent Printing, you metamorphosed all Universities, or superseded them." — *Thomas Carlyle.*

I. TYPOGRAPHY.

One of the most interesting articles in the *Encyclopædia Britannica* is that which relates to the history of printing, Volume XXIII, pp. 723–41. Here we have an account of the first attempts at printing, which antedated the time of Gutenberg and of Caxton by many years, if not by many centuries. Then follow chapters or sections on Block-Printing, p. 725; on the old block-books of German origin, p. 726; on Early Printing at Mainz, p. 727; on The Invention Controversy, p. 730; on Early Types and their Fabrication, with facsimiles, pp. 736–39, etc. In connection with the reading of this article, references may be made to the following articles:

Invention of Printing

John Gutenberg, XI, 300.

Johann Fust, IX, 750.

Great Printers

William Caxton, V, 243; books printed by him, VIII, 369.

Aldus Manutius, XV, 519, 521.

Christophe Plantin, XIX, 187.

Elzevir, VIII, 145.

Jodocus Badius, III, 196.

Stephens, or Estiennes, XXII, 561.

The History of Modern Types, XXIII, 739, next claims our attention. The Italic type, first used by Aldus Manutius, is said to be an imitation of the handwriting of Petrarch. The origin of all other types in common use is explained in this chapter, which closes (pp. 740–41) with a list of works on the invention, progress, and process of printing. Some notice of early English typography is given in XIV, 711, and also in VIII, 369.

Types

The latter half of the article on Typography, XXIII, 741–57, is devoted to the discussion of practical printing. Here are separate chapters on Type-Setting, or Composing, p. 745; on Stereotyping, electrotyping, etc., p. 748; on Press-Work and Presses, p. 750; on Color Printing, p. 755; on artistic printing, p. 756; on the departments of a printing establishment, p. 757.

In connection with this part, refer to the articles, Engraving, VIII, 388; and Lithography, XIV, 703. The following articles also contain additional information on subjects connected with the printer's art:

Old Wine-press of Gutenberg, XXVIII, 490.

Presses

The Stanhope Press, XXVIII, 490.

The Adams Press (1824), XXVIII, 490.

The Washington Press, XXVIII, 490.

Job Presses, XXVIII, 491.

Cylinder Presses, XXVIII, 491.

Illustrated-work Printing Machines, XXVIII, 492.

Perfecting Presses, XXVIII, 493.

Mammoth Presses, XXVIII, 493.

Lithographic Presses, XIV, 706–07; XXII, 752.

Color Printing, XXVI, 238.

Richard M. Hoe, XXVII, 299.

University Press, XXIX, 403.

See, especially, Proof-readers' Marks, XXVIII, 497.

International Typographical Union, XXVII, 526.

Type-founding, XXIII, 744.

Type-setting machines, XXIII, 746; XXIX, 343.

The linotype, XXVII, 602.

Invention of stereotyping, X, 114.

Electrotypes, VIII, 108.

Type for the blind, III, 718; XXV, 503.

George Bruce, type-founder, XXV, 620.

Theodore L. De Vinne, XXVI, 406.

II. BOOKS AND BOOKSELLING.

See the special article on Books, IV, 33.

Constituent parts of books, III, 564.

Old Books

Ancient forms of books, XVIII, 148.

Material of ancient books, IV, 33–34.

Early printed books, III, 564.

Rare and curious books, III, 566.

Anonymous and pseudonymous books, III, 569.

Condemned and prohibited books, III, 569.

Bookbinding, IV, 36.

Albums, I, 403.

Almanacs, I, 519.

Annals, II, 54.

Anthologies, II, 91.

Encyclopædias, VIII, 173.

Libraries

Libraries, XIV, 509; Sir Thomas Bodley, III, 737; Sir Robert Bruce Cotton, VI, 452; Magliabechi, XV, 217; Mezzofanti, XVI, 232; Dibdin, VII, 149; Bibliography, III, 563–74.

Bookselling, IV, 35; book-trade in Europe, X, 424.

Copyright

Baron Tauchnitz, XXIX, 230.

Copyright, VI, 316; English laws of copyright, XIV, 542; international copyright, I, 631 b."

History of copyright since 1877, XXVI, 280.

For other references, see Chapter LVII, entitled *The Bookman*.

CHAPTER LXII

The Journalist

"We read nowadays in the market place — I would rather say in some large steam factory of letter-press where damp sheets of new print whirl round us perpetually." — *Frederic Harrison.*

History of Journalism

An entertaining and valuable article on Newspapers is contained in the seventeenth volume of the *Britannica*, pages 422–49. The history of journalism in Great Britain is given at length, and is followed by an account of the newspapers of other European countries. The Newspapers of the United States is the subject of an interesting and appreciative chapter, XVII, 444–49. In a supplementary article on the same subject, XXVIII, 221, a complete account is given of the methods pursued in the publication of a great American newspaper, and some hints are presented with reference to the qualifications of the successful journalist. This article is illustrated with views of many of the great newspaper buildings.

Methods of gathering news, XXVIII, 223.

Editorial departments of a great newspaper, XXVIII, 224.

Mailing of newspapers, XXVIII, 224.

The Sunday paper, XXVIII, 224.

Journalism as a profession, XXVIII, 226.

Associated Press organization, XXVIII, 229.

Several other articles in the *Britannica* relate directly or indirectly to this important subject. Among these the following are specially interesting:

Acta Diurna, I, 119.

Reporting, XX, 416; XXI, 880.

Advertisements, I, 161.

The article on Advertising, XXV, 52, is full of interesting facts relating to this important department of journalism, especially in America.

Printing of newspapers, XXIII, 748, 755.

Laws relating to the newspaper press, XIX, 729.

Periodicals, XVIII, 546.

History of British periodicals, XVIII, 546; of French periodicals, same volume, p. 549; of American magazines and reviews, p. 555.

American magazines, XXVII, 681.

The Associated Press, XXV, 275.

Censorship of the Press, III, 569–70.

Press Laws, XIX, 729–33.

See also Chapter LXI, entitled *The Printer and The Publisher*, in this Guide.

Famous Journalists.

Newspaper Men

Benjamin Franklin, IX, 626; his connection with American journalism, XVII, 444.

Horace Greeley, XI, 143; XVII, 446.

George Ripley, XX, 582.

John Walter and the "London Times," XXIX, 476.

Thurlow Weed, XXIX, 513.

William T. Stead, of the "Review of Reviews," XXIX, 153.

Granier de Cassagnac, XXVII, 140.

Charles A. Dana, XXVI, 352.

Joseph Gales, XXVII, 55.

Edwin L. Godkin, XXVII, 113.
Joseph Pulitzer, XXVIII, 518.
James Gordon Bennett, III, 495.
James Gordon Bennett, Jr., XXV, 428.
John W. Forney, XXVII, 7.
Henry J. Raymond, XXVIII, 556.
Whitelaw Reid, XXVIII, 572.
Joseph Medill, XXVIII, 63.
Henry Watterson, XXIX, 506.
Allen Thorndyke Rice, XXVIII, 587.
John Russell Young, XXIX, 622.

See also Chapters VII, XLII, LIX, and LXI, entitled *Five Courses of Reading in the History of Literature*, *The American Citizen*, *The Writer*, and *The Printer and the Publisher*, in this GUIDE.

CHAPTER LXIII

THE ARTIST

"In framing an artist, art hath thus decreed
To make some good, but others to exceed."
—*Pericles.*

I. PAINTING.

Schools of Painting

A GENERAL examination of the place of painting among the FINE ARTS will be found in the article under that heading, Volume IX, p. 179. But the most interesting and by far the most valuable article on this subject is that entitled SCHOOLS OF PAINTING, XXI, 450–69. This article may be read by sections, with collateral references to other articles and to the notices of individual painters, as indicated below:

1. Classical School of Painting.

For the early history of painting among the Greeks and Romans, see Volume II, pp. 308, 313, 317, 320.

See also Zeuxis, XXIV, 822; Parrhasius, XVIII, 326; Sicyon, II, 305; Apelles, II, 149.

2. Italian School of Painting, XXI, 451; Giotto, X, 543; Masaccio, XV, 611; Fra Lippo Lippi, XIV, 690; Sandro Botticelli, IV, 150; Michelangelo, XVI, 237; Andrea del Sarto, XXI, 330; Giorgio Vasari, XXIV, 102; Raphael Sanzio, XX, 286; Leonardo da Vinci, XIV, 456; Salvator Rosa, XX, 869; Titian, XXIII, 441.

3. German School of Painting, XXI, 457; Hans Holbein, XII, 55; Albrecht Dürer, VII, 478; Hans Holbein, the younger, XII, 56; Anton Raphael Mengs, XVI, 14; Julius Schnorr, XXI, 434; Johann Friedrich Overbeck, XVIII, 80; Wilhelm von Kaulbach, XIV, 18.

4. Flemish School of Painting, XXI, 457; Van Eyck, VIII, 712; Van der Weyden, XXI, 458; Hans Memling, XV, 854; Quintin Matsys, XV, 626; Antonio Moro, XVI, 856; Rubens, XXI, 46; Vandyck, XXIV, 66.

5. Dutch School of Painting, XXI, 459; Ruysdael, XXI, 459; Vandevelde, XXIV, 66; Paul Potter, XIX, 617; Hobbema, XII, 32; Rembrandt, XX, 385.

6. Spanish School of Painting, XXI, 459; Zurbaran, XXIV, 868; Velasquez, XXIV, 143; Murillo, XVII, 61; Goya, XI, 20; Fortuny, XXI, 460.

7. French School of Painting, XXI, 460; Nicolas Poussin, XIX, 669; Claude Lorraine, V, 711; Watteau, XXIV, 436; Claude Vernet, XXIV, 183; Prud'hon, XX, 5; Horace Vernet, XXIV, 183; Delaroche, VII, 38; Rousseau, XXI, 28; Millet, XVI, 334; XXVIII, 100; Corot, VI, 382; Meissonier, XXVIII, 65; Regnault, XX, 359; Rosa Bonheur, XXV, 541.

Impressionism in French Art, XXVII, 368.

8. British School of Painting, XXI, 460; Hogarth, XII, 49; Sir Joshua Reynolds, XX, 516; Gainsborough, X, 15; John Hoppner, XII, 162; George Romney, XX, 861; Richard Wilson, XXIV, 624; Paul Sandby, XXI, 269; Sir Henry Raeburn, XX, 225; William Blake, III, 698; John Crome, VI, 527; John Constable, VI, 264; Eastlake, VII, 532; Sir Edwin Landseer, XIV, 280; Holman Hunt, XXVII, 341–42; J. M. W. Turner, XXIII, 705; Dante Gabriel Rossetti, XX, 880; E. J. Poynter, XXVIII, 476; Burne-Jones, XXV, 652; Sir Frederick Leighton, XXVII, 573–74; Sir John Millais, XXVIII, 98; George F. Watts, XXIX, 506.

9. American Painters: Thomas Hill, XXVII, 290; Winslow Homer, XXVII, 309; William M. Hunt, XXVII, 342; George Inness, XXVII, 390; Eastman Johnson, XXVII, 454; John La Farge, XXVII, 534; Will H. Low, XXVII, 637; F. D. Millet, XXVIII, 101; Washington Allston, XXV, 142; John Singleton Copley, VI, 308; Benjamin West, XXIV, 533; John S. Sargent, XXVIII, 676.

II. PROCESSES OF PAINTING.

Materials used in Painting, XVIII, 141.

Painting in water-colors, XVIII, 143, and XIX, 94.

Enamel—on metal, VIII, 167; in jewelry, XIII, 689; in pottery, XIX, 618.

Encaustic painting, VIII, 170.

Genre-painting, XXVII, 76.

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Raphael's frescos, XX, 290.

Glass-painting, X, 596.

Aureola, III, 78.

Tempera, XXIII, 173.

Illumination, XII, 745.

Mural Decoration, XVII, 40–54, a beautifully illustrated article.

Wall-painting, XVII, 45–54.

Miniatures, XVI, 456.

Crayon, or Pastel, VI, 492.

III. SCULPTURE.

For the history of Greek and Roman sculpture, see the article on CLASSICAL ARCHÆOLOGY, II, 291–322; also

History of Sculpture

Phidias, XVIII, 747; Polycletus, XIX, 430; Scopas, II, 315; Praxiteles, XIX, 680; Lysippus, XV, 121; Arcesilaus, II, 286.

Assyrian Sculpture, III, 164.

Etrurian Art, VIII, 561.

Early Christian Sculpture, XXI, 583.

Mediæval and Modern Sculpture, XXI, 583–99.

English Sculpture, XXI, 584; John Flaxman, IX, 260; Francis Chantrey, V, 343; Alfred Stevens, XXI, 588.

French Sculpture, XXI, 588; Jean Antoine Houdon, XII, 327; François Rude, XXI, 56; David, VI, 736; Antoine Louis Barye, XXV, 376.

German Sculpture, XXI, 590; Vischer, XXI, 592; Schlüter, XXI, 593; Albert Wolff, XXI, 593; August Kiss, XXVII, 505.

Spanish Sculpture, XXI, 593.

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Venetian Sculpture, XXIV, 169; Veronese, XXIV, 186.

Scandinavian Sculpture, XXI, 597; Thorwaldsen, XXIII, 335.

American Sculpture: Hiram Powers, XIX, 670; Thomas Crawford, VI, 491; Horatio Greenough, XI, 155; Henry Kirke Brown, XXV, 612; W. W. Story, XXIX, 168; Harriet Hosmer, XXVII, 325; John Rogers, XXVIII, 607; Larkin G. Mead, XXVIII, 56; Augustus St. Gaudens, XXVIII, 645; R. S. Greenough, XXVII, 167; Clark Mills, XXVIII, 101; Frederick McMonnies, XXVII, 676.

Technical methods of sculpture (how a piece of statuary is made), XXI, 598.

Alto relievo, I, 565.

Relief, IX, 179; relief in wall decorations, XVII, 40; relations of sculpture to the Fine Arts, IX, 179.

IV. POTTERY, ETC.

The special article on this subject, XIX, 617–64, is one of much interest, amply and beautifully illustrated. The article on Ceramic Art, XXVI, 97, describes the development of this art since 1880, and is full of interesting facts. See also the article on the Pottery Industry in the United States, XXVIII, 473–74.

Pottery and Porcelain

Prehistoric Pottery, XIX, 619.

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Etruscan, XIX, 633.

Græco-Roman and Roman, XIX, 635.

Persian and Moslem, XIX, 638.

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Majolica-ware, XIX, 643.

Faience, XXVI, 609.

Spanish and Portuguese, XIX, 648.

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Bernard Palissy, XVIII, 190.

Mediæval German-ware, XIX, 650.

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Josiah Wedgwood, XXIV, 503.

Ancient Mexican-ware, XIX, 652.

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Kaolin, XIV, 3.

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Sèvres-ware, XIX, 657.

Dresden-ware, XIX, 659.

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Mosaic-work, XVI, 876; of Egyptians and Romans, XVI, 877; of the Middle Ages, XVI, 879.

V. METAL-WORK.

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Of Italy, XVI, 80.

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Japanese bronze-work, XIII, 601.

Chinese bronze-work, IV, 330.

Venetian bronze-work, XXIV, 169.

Iron-work in architecture, II, 410.

Hammered metal-work, XVI, 78.

Damaskeening, VI, 698.

VI. WOOD-WORK.

Wood-carving, XXIV, 678, a six-page illustrated article treating mainly of ancient and mediæval work.

Wood-carving

Wood-carving in Switzerland, XXII, 818.

Buhl-work, IV, 399.

Inlaying, XIII, 88.
Marquetry, IX, 746.

VII. PHOTOGRAPHY.

Special article on PHOTOGRAPHY, XVIII, 834–54, with supplement giving an account of the most recent improvements and discoveries, XXVIII, 410. See also:

Progress of Photography

Daguerre, VI, 671.
Niepce, XVII, 508.
W. H. Fox Talbot, XXIII, 32.
Photogravure, XXII, 754.
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Photolithography, XVIII, 846–47.
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Instantaneous photography, XXVIII, 411.
Photographs in natural colors, XXVIII, 412.
Woodburytypes, XXIX, 585.
Albertypes, XXV, 121.
Artotypes, XXV, 264.
Photochronograph, XXVIII, 410, 417.
Dry plates, XXVIII, 413.
Plantinotypes and kallitypes, XXVIII, 416.
Astronomical photography, XXVIII, 416.
Rœntgen, or X rays, XXVI, 539; XXVIII, 412.

VIII. ENGRAVING.

Special article on ENGRAVING, VIII, 388. A valuable supplementary article on engraving, giving an account of the latest advancement made in the art, may be found in XXVI, 577–80. Wood-engraving, VIII, 388; early engraving on wood, V, 88; in time of Albrecht Dürer, VII, 478; Bewick, III, 537.

History of Engraving

Copper and steel plate engraving, VIII, 391; Mantegna, XV, 508; Audran, III, 61; Ferdinand Gaillard, VIII, 394.

Half-tone process, XXVI, 578.
Wax process, XXVI, 579.
Etching, VIII, 394.
Mezzotint, VIII, 396.
Lithography, XXVII, 610.

IX. MISCELLANEOUS.

DRAWING, VII, 385–90. Beginning on p. 387, the article is an interesting and very readable critique on the art of delineation as practiced by different artists and in different countries.

Drawing

Illumination of written or printed texts, XII, 745; illuminated borders of books, XXIII, 741.
Illuminated manuscripts, VI, 399; XII, 745.
Caricature, V, 91.
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Embossing, VIII, 148.
Stamped leather for wall-decoration, XVII, 43.
Embroidery, VIII, 148.
Gilding, X, 530.
Etching, VIII, 394.
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Lapidary, XIV, 298.
Cameo, IV, 653; cameos of mediæval times, IV, 653.
Work in ivory, XIII, 530.
Jewelry, XIII, 686–90.
Decalcomania, XXVI, 376.

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X. ILLUSTRATORS.

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Felix O. Darley, XXVI, 355.
Gustave Doré, XXVI, 438.
John Leech, XIV, 405.
Sir John Tenniel, XXIX, 251.
George du Maurier, XXVI, 465.
Charles S. Keene, XXVII, 483.
Mary Hallock Foote, XXVI, 677.
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Kate Greenaway, XXVII, 164.
Augustus Hoppin, XXVII, 320.
Thomas Nast, XXVIII, 172.
Joseph Pennell, XXVIII, 375.
Charles S. Reinhart, XXVIII, 572.
Frederic Remington, XXVIII, 573.
See Art Unions, XXV, 264.

CHAPTER LXIV

The Musician

"Such sweet compulsion doth in music lie."—*Milton.*

Although America has not yet produced a great composer of music, it has nevertheless a copious and important musical history. The article on Music in America, XXVIII, 162, wherein this history is narrated, will therefore be read with great interest, and doubtless also with profit, by every American musician who wishes to know anything about the origin and progress of music in his own country.

In the seventeenth volume of the *Encyclopædia Britannica* (pp. 84–108), Professor Macfarren, of the University of Cambridge, presents an excellent and comprehensive history of music, tracing its progress through western civilization, and showing how it has been changed from an artificial, or calculated form to a natural, or spontaneous one. This article not only appeals specially to musicians and students of music, but contains much that will interest the casual reader. It may be taken as the basis of a short course of study on this subject. It may be read in sections in connection with other special articles, as follows:

History of Music.

Origin of musical instruments, p. 85. See list of musical instruments, p. 227.

Musical intervals, XVII, 85, 109.

Affinity of music to astronomy, XVII, 85. See Pythagoras, XX, 143.

Antiphony, XVII, 86; also II, 118.

Scales, XVII, 88.

Time in music, XXIX, 289.

Tone in music, XXIX, 300.

Harmony, XVII, 88. Special article on, VII, 512. The principles of harmony are treated still further in part IV of the article Acoustics, I, 100.

Harmony

Counterpoint, XVII, 89.

Academies of music, XVII, 90. See also Academy, I, 75, and Conservatory, VI, 260.

Troubadours, XVII, 91; also VII, 357; Minstrel, XVI, 502.

Oratorio, XVII, 92–107; also Handel's, XI, 387; Haydn's, XI, 481; Mendelssohn's, XVI, 10; in America, XXVIII, 164.

Hymns, XVII, 92; also the special article on that subject, XII, 612.

Psalmody in America, XXVIII, 163.

Choral tunes, XVII, 93.

Opera, XVII, 94, 106. See Scarlatti, XXI, 392; Lully, XV, 64; Wagner, XXIV, 334.

Cantata, XVII, 95.

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Among the many other articles on

musical subjects the following are of special interest:

Voice, and vocal music, XXIV, 293.

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Agnus Dei, I, 254.

Almai (Egyptian singers), I, 521.

Ballads, III, 244.

Glee, X, 604.

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Scientific basis of music, XVII, 109–13, an excellent article by Professor Bosanquet, of the Royal College of Music, London.

MUSICAL INSTRUMENTS.

Accordion, I, 86.

Concertina, XXVI, 247.

Drum, VII, 414.

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Transverse flute, XXIII, 552.

Flageolet, IX, 307.

Bassoon, III, 368.

Lyre, XV, 114.

Æolian harp, I, 165, and XXV, 54.

Harp, XI, 436.

Guitar, XI, 237.

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Mandolin, XV, 72.

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Violoncello, XXIV, 263.

Banjo, XXV, 344.

Hornpipe, XII, 175.

French horn, XII, 171.

Dulcimer, XXVI, 464.

Oboe, or hautboy, XVII, 724.

Clarinet, XVII, 727.

Trumpet, XXIII, 629.

Trombone, XXIII, 623.

Ophicleide, XVII, 799.

Organ, XVII, 852–63.

Barrel-organs, XXV, 368.

Pianoforte, XIX, 72–87.

Zither, XXIX, 631.

Autoharp, XXV, 303.

MUSICAL COMPOSERS, SINGERS, AND INSTRUMENTAL PERFORMERS.

These are so numerous that we shall name only some of the most famous. Reference to others may easily be made by consulting the Index volume.

Palestrina (1524?–94), XVIII, 183.

Lully (1633–87), XV, 64.

Composers

Purcell (1658–95), XX, 118.

Scarlatti (1659–1725), XXI, 392.

Handel (1685–1759), XI, 387.

Bach (1685–1750), III, 168.

Gluck (1714–87), X, 618.

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Clementi (1752–1832), V, 720.

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CHAPTER LXV

The Actor and Dramatist

"The best actors in the world, either for tragedy, comedy."—*Hamlet.*

The word drama is from the Greek *drao*, meaning action. The invention of dramatic art is the direct outcome of a universal quality of human nature—the desire to imitate. Aristotle says that this desire is instinctive in man from his infancy. Children are perpetually going out of themselves; it is one of their chief amusements to represent those grown people whom they have had an opportunity of observing, or whatever strikes their fancy; "and, with the happy pliancy of their imagination, they can exhibit all the characteristics of any dignity they may choose to assume, be it that of a father, a schoolmaster, or a king." Here, then, is the first step towards the invention of the dramatic art. Imitation of action by action, however simple and unpremeditated, is drama in embryo. The business of the dramatist is to invent this action and to mould it into a form sanctioned by the laws of literature. It is the business of the actor to present this action in its concrete form, agreeably to the laws of histrionic art. The actor is only the temporary interpreter of the dramatist.

The Drama

The history of the drama, which includes both dramatic literature and its presentation on the stage, is a subject very interesting not only to all actors and dramatists, but to students of literature and art and humanity, and even to "the general reader."

History

The *Encyclopædia Britannica* presents that history in a form adapted to the convenience of all who care to peruse it, while its various related topics are so grouped and arranged as to afford every convenience for ready consultation. The following references, including the entire history of the drama and of dramatic representation, will point the way to several courses of systematic reading:

I. HISTORY OF THE DRAMA.

Egyptian drama, VII, 348.
Chinese drama, VII, 346.
Hindu drama, VII, 343.
The Sákuntalá of Kálidása, XIII, 838; VII, 343.

The Greek drama, VII, 349, comprised two great divisions, tragedy and comedy.

The traditional inventor of tragedy was Thespis, VII, 349: hence the expression Thespian art, so often used to designate dramatic art.

Greek Drama

Tragedy was defined by Plato as an imitation of the noblest life.

Comedy had its origin in sport; it was "the village song," the rustic jest, and formed the most complete contrast to tragedy.

Origin of tragedy, XI, 125.

The great masters of Greek tragedy were Æschylus, I, 188; VII, 350; Sopho-

cles, XXII, 284; and Euripides, VIII, 590; XI, 125.

The construction of the Greek tragedy was essentially different from that of the modern play. See VII, 351.

Origin of comedy, VII, 352.

The greatest master of Greek comedy, although by no means its inventor, was Aristophanes, II, 446. He was the representative of the Old Comedy, the distinctive features of which are described in VII, 352.

Of the Middle and the New Comedies, the greatest names are those of Eubulus and Menander, XVI, 5.

The Attic drama, represented by the great names just mentioned, had its origin in religion, VII, 353. Its religious character had much to do in modifying its representation upon the stage.

The Roman Drama—its origin, VII, 354.

Livius Andronicus, who was both dramatist and actor, produced the first regular Roman tragedy and the first great Roman comedy, XIV, 729; VII, 354. Other tragedians were:

Roman Drama

Gnæus Nævius, XVII, 168.

Quintus Ennius, VIII, 398; XX, 736.

Lucius Accius, I, 80.

Lucius Annæus Seneca, XXI, 690.

Of the writers of Latin comedy the greatest names are

T. Maccius Plautus, XIX, 226.

Terence, XXIII, 203; XVI, 6.

With the triumph of the Christian Church in the 4th century, the Roman drama came to an end, VII, 356.

The Christian drama had its origin in dramatic compositions written doubtless for educational purposes as early as the 5th century.

St. Gregory Nazianzus, XI, 160; VII, 357.

Hrosvitha, XII, 340.

Mediæval Plays

Mystery-plays, VII, 357.

Miracle-plays, V, 281.

Moralities, VIII, 371; VII, 357.

Passion-play of Oberammergau, XVII, 723; XXVIII, 270.

The English drama was the offshoot of the miracle-plays and moralities which survived even after the regular tragedy and comedy of the modern stage had begun their course.

English Drama

The first tragedy proper in the English tongue was *Gorboduc*, by Thomas Sackville, Lord Buckhurst, VIII, 371.

The earliest English comedy now extant was *Ralph Roister Doister*, by Nicholas Udall, XXIII, 763.

"Out of such promises as these the glories of our drama were ripened by the warmth and light of the great Elizabethan age." Of the Elizabethan dramatists, the following are the most famous:

John Lyly, VII, 371; XV, 104.

Thomas Kyd, XXI, 799.

Christopher Marlowe, XV, 563.

George Peele, XVIII, 468.

Robert Greene, XI, 146.

Thomas Lodge, XIV, 774; XVIII, 351.

Thomas Nash, XVII, 242.

William Shakespeare, XXI, 773. (See Index volume, page 820.)

Ben Jonson, XIII, 751.

John Webster, VII, 373.

Francis Beaumont, III, 405.

John Fletcher, XVIII, 352.

Philip Massinger, XV, 624.

The Puritans and the Drama, VII, 374–75.

Milton's *Comus*, XVI, 338.

Sir William Davenant, VI, 735.

Drama of the Restoration, VII, 375–76.
John Dryden, VII, 421; VIII, 377.
William Wycherley, XXIV, 741.
William Congreve, VI, 240.
Sir John Vanbrugh, XXIV, 61.

Drama of the 18th century, VII, 376–79.
Addison's *Cato*, VIII, 379; VII, 376.
Home's *Douglas*, XII, 111.
Allan Ramsay's *Gentle Shepherd*, XX, 278.
Gay's *Beggar's Opera*, X, 108.
Henry Fielding's comedies, IX, 125; VIII, 383.
Goldsmith's comedies, X, 678; VII, 378.
Sheridan's comedies, VII, 378; XXI, 833.

Drama of the 19th century, VII, 379–80.
Byron's *Manfred*, IV, 537; VII, 379.
Shelley's *The Cenci*, VII, 379; XXI, 830.
Bulwer-Lytton's *Richelieu*, XV, 122.

Modern Italian Drama, VII, 360–61.
Cinthio's *Hecatommithi*, X, 553.
Marquis S. Maffei, XV, 197.
Italian Drama — Alfieri, I, 443.
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Guarini's *Pastor Fido*, XI, 210.
Goldoni, X, 676; XIII, 523.

The Spanish Drama, XXII, 370, 372; VII, 362.
Cervantes, XXII, 370; V, 302.
Spanish Drama — Lope de Vega, XXII, 371; VII, 364; XXIV, 132.
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Moreto, VII, 365; XVI, 847.
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The Classical Drama, IX, 577.
Robert Garnier, VII, 366.
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Molière, IX, 582; XVI, 646.
French Drama — Victor Hugo, VII, 369; IX, 597.
Minor dramatists, IX, 583.
Dramatists of the Empire, IX, 596.
Victorien Sardou, XXVIII, 675.
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The German Drama, X, 474; VII, 380.
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Hans Sachs, X, 473; Gustav Freytag, X, 487.
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Later Dramatists, X, 487.
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The Dutch Drama, XII, 94, 99.
Hooft, XII, 97, 150.
Dutch Drama — Van den Vondel, VII, 383; XII, 97.
Maurice Maeterlinck (Belgium), XXVII, 680.

The Scandinavian Drama, VII, 80, 383; XVII, 605.
Holberg, XII, 58.
Oehlenschläger, XVII, 751.
Björnstjerne Björnson, XVII, 605.
Henrik Ibsen, XVII, 605.

II. THE THEATRE.

By this word we have reference to a place specially devised for dramatic representations. See the following arti-

cles or parts of articles in the *Encyclopædia Britannica:*

The Greek theatre, its invention and plan, XXIII, 240; II, 362.

Dionysiac Theatre at Athens, III, 5.

The Roman theatre, VII, 356; XXIII, 242; II, 367.

Amphitheatre, X, 60; I, 679.

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Blackfriars Theatre, VIII, 373.

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Theatres of Paris, XXIII, 243; XVIII, 281.

Drury Lane Theatre, XXIII, 244.

Theatres of New York, XVII, 473.

Chinese theatres, V, 578.

The Stage

The stage in Greek theatres, VII, 353.

In Roman theatres, VII, 356.

In early English theatres, VIII, 374.

In modern theatres, XXIII, 243.

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III. ACTORS AND ACTING.

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Actors: Greek, VII, 353; Roman, VII, 356; Hindu, VII, 345; English, VII, 375, 379; Chinese, VII, 348.

Livius Andronicus, XIV, 729.

Richard Burbage, XXI, 797.

Thomas Betterton, III, 533.

David Garrick, X, 76.

Sarah Siddons, XXII, 38.

John Kemble, XIV, 32.

Fanny Kemble, XXVII, 485.

Edmund Kean, XIV, 23.

William Charles Macready, XV, 167.

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Charlotte Cushman, XXVI, 340.

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Hortense Rhea, XXVIII, 582.

Minnie (Maddern) Fiske, XXVI, 655–56.

Julia (Marlowe) Taber, XXIX, 216.

In general, the names and biographies of all the most popular actors on the American stage may be found by consulting the American supplements to the *Encyclopædia Britannica.*

IV. THE ART OF DRAMATIC COMPOSITION.

See VII, 338–43.

In the first place, a dramatic action must possess unity. See VII, 339; XVI, 87.

It must be complete. See VII, 339.

Prologues and epilogues, VII, 340.

See Chorus in Greek Drama, XVII, 87.

Climax and catastrophe, VII, 340.

Characterization, VII, 341.

Consistency, VII, 341.

Tragedy and comedy, VII, 342.

Gesture, speech, costume, VII, 342–43.

CHAPTER LXVI

The Home-Maker

"Our books, gardens, family, scenery, might all bring forth to us far greater wealth of enjoyment and improvement if we tried to squeeze the very utmost out of them." — *Charles Buxton.*

"A home without books is like a room without windows."
— *Henry Ward Beecher.*

The *Britannica* would be lacking in completeness if it did not contain a number of practical articles on topics of domestic interest and utility. An examination of any single volume will show that it is not in the least deficient in this respect. To any person having in charge the affairs of a home or a family, this great work offers a variety of useful information that is not to be found in any similar publication.

A. THE HOUSEHOLD.

Do you think of building a house for yourself? See the article on Building, IV, 400. Consult, also, the supplementary article on American Architecture, XXV, 224; and notice the practical references in Chapter XXIX, entitled *The Builder*, in this Guide. Then refer to the following valuable articles or parts of articles:

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Sanitation of the house, XII, 601.

Progress in American sanitary science, XXVIII, 442.

Ventilation of the house, XII, 601; ventilation by chimneys, XXIV, 172.

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Heating apparatus, XI, 527; XXIV, 174; XXVII, 49.

Stoves, XXII, 607.

Ventilation, XXIV, 171.

The latest improvements in cooking-stoves, XXIX, 168.

FURNISHING.

After the house has been built, other questions will present themselves, and the following articles in the *Britannica* will be read with interest:

Furniture, IX, 745.

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Chairs, IX, 746.

Carpets, V, 112.

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The busy housewife, upon whose wisdom and discretion so much of the family happiness depends, will find a vast fund of information, and often some valuable practical suggestions, in such articles as these:

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Tea, XXIII, 104.
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Lard, XIV, 312.
Use of salt in food, XXVI, 674.
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Sugar in the United States, XXVIII, 22; XXIX, 190.
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What to do in case of asphyxiation, II, 626.
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What to do in case of burns, XXII, 716.
Burns and scalds, XXV, 653.
Some rules for the care of the sick, VII, 178.
Other topics will suggest themselves to every intelligent housekeeper, and these may generally be found by referring to the Index volume.
See also Chapters XXXII, XXXIII, XXXIV, and L, in this GUIDE, entitled respectively, *The Farmer*, *The Gardener*, *The Fruit-Grower*, and *The Physician*.

B. SOCIAL LIFE.

DRESS.

A long list of articles on subjects connected with the social life of the home might be given here. The following will be sufficient to indicate their number and variety:
Costume: In Volume VI, p. 400, there is a complete history of dress, with illustrations.
Gloves, X, 617.

Girdles, X, 555.
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